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the USAF, then surveys the current program and its capability to provide such training with respect to aircrew readiness and likely future operations of air expeditionary force employment. The study then compares contemporary operational and threat environments with those of the previous two decades in order to analyze the need for dedicated adversary air training. Future adversary air training alternatives are then proposed and analyzed using a framework of threat replication fidelity, breadth of coverage, and affordability. Finally, a path is offered for transition to the recommended capability.

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FULL CIRCLE?

THE TRANSFORMATION OF DEDICATED ADVERSARY AIR TRAINING IN THE USAF

BY

MATTHEW P. DONOVAN

A THESIS PRESENTED TO THE FACULTY OF

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DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the U.S. Government, Department of Defense, the United States Air Force, or Air University.

Contents

Page

Preface

Major Matthew P. Donovan was commissioned through the USAF Officer Training School in 1982. Graduating from Undergraduate Pilot Training in 1983, he went on to fly the F-15A in Tactical Air Command. Following an assignment as an F-5E Aggressor instructor pilot, he returned to the F-15C to serve a remote tour in Iceland, then was assigned as an F-15C fighter training unit instructor pilot. He was subsequently selected as the Air Combat Command F-15 West Coast Demonstration Team commander. He then served in the Air Education and Training Command's Command Action Group as an action officer and deputy director. Major Donovan is a command pilot with over 2200 flying hours. He holds a bachelor's degree in technical management from Regis College in Denver, Colorado and a master's degree in management from Webster University. Major Donovan is a distinguished graduate of the Air Command and Staff College resident program. In October 1998, Major Donovan returned to flying the F-15C with the 3rd Fighter Wing, Elmendorf AFB, Alaska.

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Most importantly, I want to express my sincere appreciation to my wife Katherine, daughter Kelsey, and son Patrick for their love, patience, and understanding during those times when I was alone in contemplation while writing this paper. Their support was crucial in ensuring my success in completing this work.

ABSTRACT

This study analyzes the characteristics of dedicated adversary air training in past, current, and future U.S. Air Force operations. The author provides the background and history of such training within the USAF, then surveys the current program and its capability to provide such training with respect to aircrew readiness and likely future operations of air expeditionary force employment. The study then compares contemporary operational and threat environments with those of the previous two decades in order to analyze the need for dedicated adversary air training. Future adversary air training alternatives are then proposed and analyzed using a framework of threat replication fidelity, breadth of coverage, and affordability. Finally, a path is offered for transition to the recommended capability.

Chapter 1

Introduction

> *The US Air Force's fundamental service to the nation is its ability to develop, train, sustain, and integrate the elements of air and space power to execute its core competencies across the spectrum of peace and war.*

Air Force Doctrine Document 1

September 1997

During a significant portion of the Cold War, from the Vietnam era to 1990, the United States Air Force Aggressor program was an important and vital element of the service's effort to train its combat aircrews for the rigorous demands of air warfare. This program, established in 1972 in response to unacceptably low USAF air-to-air kill ratios in Southeast Asia, eventually expanded to provide dedicated, dissimilar adversary air training on Soviet aircraft and tactics to USAF combat units worldwide. At the peak of the program in the latter half of the 1980s, there were four Aggressor squadrons representing a fighter wing equivalent (FWE) of 72 aircraft. Two of these squadrons were at Nellis AFB, Nevada and one each at RAF Alconbury, United Kingdom, and Clark AB, Republic of the Philippines. Since 1988, the USAF has reduced this combat training capability by 92%, maintaining only a small contingent of dedicated adversary aircraft.

This thesis examines whether dedicated adversary air training has a place in the modern global environment. That environment is marked by the absence of a peer competitor to U.S. airpower, and an increased frequency of peace operations and military operations other than war. In his Senate confirmation hearing for Director of Central Intelligence in 1993, R. James Woolsey described the changing nature of the threats to American security as follows: "although the Soviet Union was a large dragon, now slain, we live now in a jungle filled with a bewildering variety of poisonous snakes." Notwithstanding the proliferation of very capable threat aircraft through the fracturing of the Soviet Union, the availability, quantity, and quality of air combat training for sustained aircrew combat readiness becomes a major issue in light of the marked increase in operations tempo for U.S. Air Force units deploying to various locations around the globe.

From 1973 to 1990, the Aggressors, flying T-38s, then F-5Es, and finally F-16s, provided adversary threat training to many hundreds of U.S. and allied combat crews. Not only did the Aggressors form the core of the adversary training program for USAF large-scale composite force exercises such as RED FLAG and COPE THUNDER, they also provided adversary threat and dissimilar air combat training (DACT) for tactical level exposure at combat fighter wings around the globe. Then, quite suddenly and a full three years before the Soviet Union collapsed, the Aggressors embarked on a major transformation in their role and mission within the USAF. Although seemingly at the apex of its productivity in training the combat air forces (CAF), the program began twisting in the fiscal wind and withered away to what today is a shadow of its former self.

Various factors acted to diminish the scope of the Aggressor program. The Air Force found itself in the throes of defense budget reductions and a subsequent drawdown. Also, in the late 1980s there were many combat fighter units in the Air Force and other services available to provide DACT for each other. As DACT was a *sine qua non* for the creation of the Aggressor program, this produced a perception of reduced need for a dedicated adversary air training organization. In addition, the fall of the Berlin Wall in 1989 caused a perceived reduction in the Soviet threat. This development preceded the closing of the Aggressor squadrons in both the Pacific and European theaters.

The Air Force inactivated its last Aggressor squadron in October 1990. Operating the last vestige of dedicated adversary aircraft in the Air Force, the Adversary Tactics division of the RED FLAG organization retained only six F-16s that were relegated to providing adversary training support for RED FLAG and other local Nellis exercises. All of this activity took place before the final dissolution of the Soviet Union in 1991.

The transformation of the Aggressor role in training the CAF raises many questions. Did senior Air Force leaders possess an uncanny prescience of future world events? Alternatively, did the Aggressor program merely begin to outlive its usefulness even before hints surfaced of the demise of the USSR? While the transformation of the Aggressors appears to have been driven by various factors, nearly every USAF combat aircrew that participated in the Persian Gulf War against Iraq had trained against the Aggressors. This training occurred either through major exercises such as RED FLAG or COPE THUNDER, or road show visits by Aggressor detachments.[1] During the six-week

[1] The 64th and 65th Aggressor Squadrons deployed 605 times between July 1973 and August 1990, covering every Tactical Air Command fighter base. Unpublished Aggressor history, undated, from the archives of the 57th Wing Historian, Nellis AFB, Nevada, 17 March 1998.

air war, USAF fighters shot down 31 Iraqi fighter aircraft without the loss of a single friendly aircraft due to air-to-air combat.[2] This dramatic success is subject to two interpretations. Either the adversary training was effective in enhancing the quality of combat aircrew performance, or the Iraqi Air Force was so incapable that even a moderately well-trained and equipped force could have defeated it. It is beyond the scope of this thesis to attempt to resolve this issue. However, the U.S. Air Force's air-to-air success in Operation DESERT STORM highlights the fact that continued readiness and competence in this arena is vital to our future success.

Has the threat that the Aggressors so aptly simulated disappeared? While the Soviet Union has disappeared from the international scene, the legacy of its powerful air force has not. Some former Soviet republics inherited Soviet combat aircraft and tactical doctrine. Even after breaking their bonds with Moscow, while most of these newly established republics enjoy improved relations with the West, many turned to exporting their military hardware for economic reasons. Occasionally this hardware is provided to nations whose interests are not compatible with those of the United States and its allies.

The transition of the U.S. military posture from a Cold War stance to greater emphasis on expeditionary operations, coupled with a massive draw down in types and numbers of combat aircraft, requires the adversary training capabilities of the Air Force to evolve in response to the changed defense environment. The current trend of limited DACT opportunities and reduced air combat training due to real world commitments threatens a full circle return to the atrophied air combat skills of the U.S. Air Force in the

[2] United States General Accounting Office, GAO/NSIAD-97-134, *OPERATION DESERT STORM: Evaluation of the Air Campaign*, (Washington, DC: Government Printing Office, 1997), p.171.

pre-Vietnam era. Senior USAF officials must make far-reaching decisions concerning the future of dedicated adversary air training during an environment of reduced defense budgets. These decisions must address questions concerning the existence, composition, objectives, organization, and implications of such a dedicated adversary air training capability.

Methodology

The burden of this study is to determine what form of dedicated adversary air training capability will best meet the present and anticipated future needs of the USAF. This issue will be examined through a combination of historical inquiry and criteria-based analysis.

Chapter Two examines the development of dedicated adversary air training from its genesis in the wake of the Vietnam War until the end of the Cold War circa 1990. Unit histories, official Air Force documents, personal interviews with key participants of the period, and various secondary source materials are used to describe the contextual environment and assess the essential factors that precipitated the creation and ultimate transformation of dedicated adversary air training.

Chapter Three describes the USAF adversary air training capability as it exists today and how it contributes to overall aircrew combat readiness in the Combat Air Forces (CAF). This contribution is measured through analysis of mission types and sortie rates currently conducted by the Adversary Tactics Division of the 414th Combat Training Squadron, the present day manifestation of the USAF Aggressors. Readiness maintenance policies such as the Air Force's Ready Aircrew Program (RAP) are used to examine the effectiveness of present adversary air training capabilities.

Chapter Four inventories current and projected threats as well as likely future USAF operations in light of the growing trend of air expeditionary force employment. It compares contemporary operational and threat environments with those of the previous two decades in order to analyze the need for dedicated adversary air training. The threat estimates are derived from open sources, while air expeditionary force employment doctrine is culled from USAF doctrine and operational concept documents. Personal interviews with USAF leaders from squadron commanders through general officers provide anecdotal descriptions of adversary training requirements.

Chapter Five presents several alternatives for future adversary training capabilities. These include using actual threat aircraft, a mixed training force of F-15 and F-16 aircraft, and a combination of U.S. and Russian aircraft. These alternatives are analyzed using a framework of threat replication fidelity, breadth of coverage, and affordability. Based on this analysis, the study concludes which adversary training force capability best meets the needs of the USAF and the requirements of national defense.

Chapter Six proposes a plan to transition from the current structure to the recommended capability in terms of aircraft procurement, funding, and implementation timelines.

Focus of the Study

This study examines only adversary training for air-to-air combat. It excludes ground-based adversary training support for other mission events such as surface-to-air missile defense and electronic countermeasures, except as they apply to the air-to-air combat arena.

Chapter 2

USAF Adversary Training, 1972 to 1990

> Although it may not appear to be an important factor, probably the most momentous change that the Aggressor Squadron made to the Air Force was that for the first time in the history of the United States Air Force, dissimilar aircraft were allowed to engage in air-to-air tactics.
>
> *Lieutenant Colonel Lloyd "Boots" Boothby*
>
> First Commander of the 64th Fighter Weapons Squadron (Aggressors)

The Genesis

The poor performance of U.S. Air Force fighter aircrews in air combat during the Vietnam War gave rise to the dedicated adversary air training concept. The USAF's kill ratio in air–to-air combat over Southeast Asia was an unimpressive 2.4:1 (the number of enemy aircraft shot down for each friendly aircraft lost). In contrast, during World War II, U.S. Army Air Forces pilots achieved an overall 8:1 kill ratio, while in the Korean conflict the young U.S. Air Force boasted a 10:1 kill ratio.[3]

The USAF tactical fighter force entering the war in Vietnam had neglected air combat training, especially in the area of visual maneuvering. During the 1950s and early 1960s, Air Force doctrine leaned heavily toward the nuclear-centric forces of Strategic Air Command. This drove the development of fighter-bomber technology

toward aircraft capable of high speed, low altitude operations, used to penetrate enemy air defenses to deliver tactical nuclear weapons. To prevent enemy aircraft from attacking the United States, the Air Force fielded fighter-interceptors capable of high speed, high altitude operations (F-102 and F-106 interceptors against enemy bombers). These types of fighter aircraft designs optimized high speed while sacrificing maneuverability.

A concentration of effort away from the demanding, highly perishable skills of air-to-air combat reduced the overall proficiency of USAF aircrews in that domain. General Bruce K. Holloway, former USAF vice chief of staff and himself a noted fighter ace, wrote that

Between 1954 and 1962, the USAF training curriculum for fighter pilots included little, if any, air-to-air combat. This omission was partly a result of doctrine, which then regarded tactical fighters primarily as a means for delivering nuclear ordnance. It was partly a reflection of concern for flying safety. In any event, as late as October 1963, it was reported that only four of 30 pilots in one fighter squadron had ever shot aerial gunnery.[4]

In addition to the shift in doctrine, other factors came together to de-emphasize air combat training. The advent of air–to-air guided missiles shifted the focus of air combat away from the close-in, visual turning engagement in a struggle to employ machine guns, toward an approach of firing missiles at standoff distances with minimal or no maneuvering. This air–to-air employment doctrine was typical of aircraft such as the F-

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[3] Richard P. Hallion, "A Troubling Past: Air Force Fighter Acquisition since 1945," *Airpower Journal*, (Winter 1990), 4.
[4] Bruce K. Holloway, "Air Superiority in Tactical Air Warfare," *Air University Review* 19, no. 3 (March-April 1968), 8-9.

105 Thunderchief, a large and fast fighter-bomber with relatively low maneuverability, built specifically for low altitude penetration of air defenses for the delivery of tactical nuclear weapons in a Central European scenario against Warsaw Pact forces.

The maneuverability of Air Force fighters of this period was inferior to that of the smaller, lighter, and more agile MiG-15, -17, -19, or -21 aircraft flown by the North Vietnamese Air Force. In addition, air–to-air combat training was very limited, especially for units heavily tasked with air-to-ground weapons delivery missions. Even as more maneuverable fighter aircraft such as the F-4 came into the inventory, the type and availability of aircrew training limited their effectiveness in air-to-air combat. Tactical fighter squadrons and their aircrews maintained a dual-role capability in both the air-to-air and air-to-ground roles. In the years before the conflict in Southeast Asia, a typical six-month training interval for a tactical fight aircrew consisted of over 100 air-to-ground training missions, with only six air-to-air combat missions flown during the same period.[5] When such training did take place, it was limited to air combat training engagements against opponents flying the same type of aircraft. This led to a parochial, "mirror-imaging" mindset, where fighter aircrews grew to expect their opponents nearly always to act and react in the same manner as they themselves did.

Many of these fighter aircrews first saw a dissimilar aircraft in an actual air combat engagement when thrust into combat against MiGs over Southeast Asia. In an attempt to address the marginal air-to-air combat performance by USAF fighter aircrews during 1965 to 1969 in Vietnam, the Air Force commissioned a study called Project RED BARON. The team members for the study conducted anonymous interviews of aircrews

[5] Marshall L. Michel III, *Clashes: Air Combat over North Vietnam, 1965-1972*, (Annapolis, MD: Naval Institute Press, 1997), 160.

that had been involved in air-to-air engagements with North Vietnamese aircraft. During one such interview, an aircrew member commented

All of my early ACM [air combat maneuvering] training involved hassling with the same type of aircraft I was flying, and this didn't teach me anything. It wasn't until I got back from SEA [Southeast Asia] that I got any unlike-aircraft ACM. Only then did I begin to learn the strengths of my aircraft and how to employ it against different types of fighters. This is more meaningful, and we must certainly do more of this in the future.[6]

At the outset of its involvement in Southeast Asia, the USAF conducted dissimilar air combat testing in the form of its FEATHER DUSTER program. This program, initiated in 1965, used Air National Guard F-86H aircraft to simulate the maneuverability of the North Vietnamese MiG-17. [7] While useful for producing data with respect to energy maneuverability comparisons and determining the most effective tactics for American fighter aircraft to employ against the MiG-17 (and through extrapolation for the MiG-21), the USAF never institutionalized the program for training its fighter aircrew population. In addition, the data culled from the tests were merely estimates; beginning in 1967 the USAF had the opportunity to exploit actual MiG aircraft to provide true maneuverability comparisons.[8]

FEATHER DUSTER was successful in predicting a major problem USAF aircrews would have when engaging MiGs. Because the enemy aircraft were much smaller than U.S. fighters and equipped with clean-burning engines that produced no telltale smoke trail, visual acquisition of them was extremely difficult. This factor was significant as

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[6] USAF Tactical Fighter Weapons Center, *Project RED BARON II, Air to Air Encounters in Southeast Asia, Interim Report #8,* June 1972, 6.
[7] Michel, 17-20.

"almost 60 percent of the aircraft lost in [air-to-air] combat [in Vietnam] were unaware of the attack, and another 21 percent were aware of the attack only when it was too late to initiate maneuvers."[9]

Between April and June of 1972, the U.S. Air Force and U.S. Navy conducted two high tempo air operations against North Vietnam called LINEBACKER and FREEDOM TRAIN. During this period, the air-to-air kill ratio for the USAF sank to nearly 1:1. The USAF shot down 14 MiGs while losing 13 aircraft to the North Vietnamese Air Force (NVAF). According to data from Headquarters Pacific Air Forces (PACAF) to Project CORONA HARVEST, a history of air operations over North Vietnam, the U.S. Navy and its Carrier Task Force 77 (CTF-77) fared much better than the USAF in air-to-air encounters during this same period. CTF-77 aircrews shot down 16 MiGs with the loss of only one U.S. Navy aircraft.[10]

The U.S. Navy fared much better than the Air Force during LINEBACKER/FREEDOM TRAIN because it had already implemented its own solution to air combat deficiencies in its aircrews. In 1968, in response to its own lackluster air-to-air missile performance during the first three years of the war, the U.S. Navy directed Captain Frank Ault to conduct a study to investigate possible causes. While primarily focused on less than sterling performance by Navy missiles, Ault appended a section to his study report contending that the basic problem with the poor missile employment effectiveness was that Navy aircrews, especially in the F-4, were poorly trained in air-to-

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[8] Ibid., 75-84. Israel provided the U.S. with both a MiG-17 and a MiG-21 acquired through defectors.
[9] Ibid., 280-81.

[10] Headquarters Pacific Air Forces, *Project CORONA HARVEST: USAF Air Operations Against North Vietnam, 1 July 1971-30 June 1972*, 8 June 1973, 136.

air combat. He recommended the establishment of a program to correct these deficiencies.[11]

The Navy quickly moved to create the U.S. Navy Fighter Weapons School, whose sole mission was to increase the air-to-air skills of its F-4 aircrews. In stark contrast to the Air Force's dual-role Fighter Weapons School at Nellis AFB, Nevada, The Navy's school, nicknamed Top Gun, taught only air combat skills. In addition, Top Gun did not pit its F-4s against one another, but rather against smaller, more agile jets such as the F-8 and A-4.[12] This training more closely simulated the threat environment facing Navy aircrews when they flew combat missions in SEA.

The PACAF study cited several possible reasons for the disparity between Air Force and Navy combat performance during this period. In spite of some differences in the geographical areas of operations and the types of enemy aircraft faced by the two services (newer Mig-19s and MiG–21s for the USAF and older MiG-17s for the USN), it appeared that tactics and training were the factors making the largest impact. USAF Colonel (later General and USAF Chief of Staff) Charles Gabriel, an F-4 wing commander in Thailand from October 1971 to June 1972, stated that "The single most deficient area of aircrew preparation for SEA operations has been that of aerial combat training."[13] Particularly egregious were the deficiencies in the training for the employment of air-to-air missiles, in that "aircrews exhibited inadequate knowledge in

[11] Robert K. Wilcox, Scream of Eagles: The Creation of Top Gun—And the U.S. Air Victory in Vietnam, (New York: J. Wiley, 1990), 102-3.
[12] Michel, 187.
[13] *Project CORONA HARVEST*, 138.

missile operational capabilities, fire control systems, and general missile employment procedures."[14]

As solutions to these problems, Project CORONA HARVEST authors recommended the establishment of prerequisite tours of duty outside of SEA for new F-4 aircrews to build experience in aircraft employment, and give designated aircrews pre-deployment training for SEA tours. These actions would bolster aircrew experience before they arrived for their tours in Vietnam. The authors also implored the USAF to "consider designating a percentage of trainees to receive intense air-to-air training including live missile firings, firings against drones, and operations in a hostile environment featuring *unfavorable GCI [ground-controlled intercept] and unfriendly aircraft flown by aggressive, experienced aircrews utilizing observed MiG tactics* [emphasis added]."[15] The Air Force eventually brought these aggressive, experienced aircrews together in an air combat training organization known as the U.S. Air Force Aggressors.

New Era of Air Force DACT

The manner in which the Navy paid attention to the lessons it had learned in SEA was not lost on several Fighter Weapons School instructors at Nellis. Retired Air Force Colonel Dawson R. "Randy" O'Neill, destined to become the first Aggressor squadron operations officer, estimates the birth of the Air Force version of the dedicated adversary concept as sometime late in 1971. O'Neill recalled that Roger G. Wells, a fellow FWS instructor, got the opportunity to brief then Tactical Air Command (TAC) commander General William Momyer on the Aggressor proposal. Momyer, previously the

[14] Ibid., 145.
[15] Ibid., 140.

commander of Seventh Air Force in SEA, was intimately familiar with the poor performance of USAF aircrews during the war. After receiving the briefing that recommended the establishment of an adversary flight within the 414th Fighter Weapons Squadron, Momyer asked "why not a dedicated squadron?"[16] Plans for the concept proceeded, and Nellis activated the 64th Fighter Weapons Squadron in October 1972. Lieutenant Colonel Lloyd "Boots" Boothby, a former member of the Project RED BARON investigation team, became the first commander of the new dedicated adversary unit. The new Aggressor squadron was equipped with T-38 supersonic trainer aircraft on loan from Air Training Command. After completing the training of the initial cadre of instructors drawn from FWS instructors and combat experienced fighter pilots, the Aggressors made their first deployment to a TAC fighter base in July 1973.[17] The general concept was for the Aggressor squadron to travel to TAC bases providing fighter aircrews with basic DACT and threat aircraft familiarization through replication and academic instruction.

Meanwhile, the USAF responded in another way to the lack of DACT for its fighter aircrews. In August 1972, General Momyer instituted an air-to-air "Top Off" school at the USAF FWS. Although organized too late to exert widespread impact on the air war in SEA, this school provided specially selected F-4 Replacement Training Unit (RTU) graduates with thirteen additional air-to-air training sorties in preparation for assignment to the 432nd Tactical Fighter Wing (TFW), the primary air-to-air unit in SEA. The final training sortie in this syllabus specified a four versus two scenario against non-F-4

[16] Colonel Dawson R. O'Neill, USAF (ret.), "How the Aggressors Began—I Think," *Daedalus Flyer* 38, No. 1 (Spring 1998), 14.
[17] Lloyd Boothby, (from a program for the USAF Aggressor Silver Anniversary Reunion, Las Vegas, NV, August 1997), 3.

fighters.[18] This training flight represented the first institutionalized DACT for the general Air Force fighter aircrew population.

A few months later, the end of active U.S. military participation in SEA led to the cessation of the Top Off program. However, the Aerial Attack flight of the FWS expanded its DACT program radically, flying more and more practice engagements with dissimilar aircraft. The Aerial Attack flight was flying its F-4s against the pilots of the newly formed Aggressor squadron, allowing Boothby to train his pilots in the replication of enemy aircraft and tactics. These training flights whetted the FWS instructors' appetites for DACT; and they eventually discovered that "exposure to the tactics and training programs of many different TAC, PACAF, Navy, Marine and ADC [Aerospace Defense Command] squadrons provided the impetus for even more ideas and tactics."[19]

The senior leaders of tactical fighter wings around TAC were hesitant about the Aggressor program for DACT. Previous accidents occurring during ACM training had dampened leadership enthusiasm for more "aggressive" training, especially against dissimilar and unfamiliar aircraft. While the first Aggressor deployment was scheduled for the 49th TFW at Holloman AFB, New Mexico, the 49th wing commander, anxious about the safety aspects of the flying, canceled it at the last minute. At the behest of the Director of Operations at Homestead AFB, Florida, Boothby changed the first deployment to that base. The trip ended up as "a perfect deployment, [with] a steady stream of VIP visitors who were all convinced that this was the right thing to do."[20]

Boothby stated that the primary cause for concern about the safety aspects of DACT was communication between the players in case of problems with aircraft or crew. The

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[18] Donald L. Gish, "F-4 Air-to-Air Training," *USAF Fighter Weapons Review* (Fall 1975), 2.
[19] Ibid., 3.

procedure that placated the safety concerns was the use of dedicated ground-controlled intercept (GCI) controllers that could act as a communication link between aircraft. Soviet fighter squadrons had GCI controllers integral to their fighter squadrons; the Aggressors followed suit with controllers dedicated to their missions.[21]

After the success of their initial deployment, the Aggressors and their unique training capability came into high demand. As luck would have it, a windfall of F-5Es originally bound for South Vietnam became available in late 1974. TAC opened a second Aggressor squadron at Nellis with these aircraft in 1975. The F-5E, a single seat combat version of the T-38 trainer with larger engines, more fuel capacity, and a fire control system for air-to-air weapons employment, more closely matched the capability of the rapidly proliferating MiG-21 than the T-38 could.[22] The original Aggressor squadron also began flying the F-5E in 1976.

With the continued Soviet forces buildup in eastern Europe and the proliferation of Soviet military hardware into North Korea, the two overseas combatant air commands, PACAF and United States Air Forces Europe (USAFE), quickly came on board with the Aggressor concept, opening their own Aggressor squadrons in 1975 and 1976, respectively. These new squadrons were also equipped with the F-5E, although in fewer numbers than the Nellis squadrons, which were charged with providing the initial qualification training for all Aggressor pilots for worldwide assignment, thus requiring

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[20] O'Neill, 15-16.
[21] Boothby, 4.
[22] Barry K. Wood, "Will Aggressor Squadrons Be Needed in the Future?" (student paper presented at the Army Command and General Staff College, Fort Leavenworth, KS, 1988), 24.

more aircraft and sorties. This training requirement would eventually grow to consume 36.5% of the total annual Aggressor sorties flown from 1976 to 1988.[23]

The Aggressor pilots studied the aircraft, weapons, tactics, and culture of the Soviet Air Force. The USAF perceived the Soviets as the primary threat to U.S. forces around the world and the driving force for the proliferation of Soviet aircraft and tactical doctrine to many other countries. All new Aggressor pilots were required to obtain a TOP SECRET security clearance with Special Compartmentalized Information (SCI) access. This clearance, higher than that held by most fighter aircrews, allowed Aggressors to obtain the latest and most accurate information available on Soviet equipment and tactics and to distill the information so that it was useful to the majority of combat aircrews. This provided a much-needed conduit between the intelligence and operational worlds with respect to enemy capabilities, another shortfall documented in Project RED BARON as needing urgent attention.[24]

While the length and content of the syllabus for training new Aggressor pilots varied over the years, during the program's heyday in the mid-1980s, new Aggressors attended an 18 week, 38-sortie course specializing in Soviet aircraft performance and tactics replication.[25] In addition, new Aggressors were assigned a certification topic, such as a specific model of enemy aircraft or weapon, or a particular Soviet capability, in order for them to become the single point of contact on that item for the theater in which he was

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[23] Mark M. Rumohr and Gary C. West, "F-15/F-16 Mixed Aggressor Force for the Future," (student paper presented at the Air Command and Staff College), Maxwell AFB, AL, 1988, 4.
[24] USAF Tactical Fighter Weapons Center, *Project RED BARON II, Air to Air Encounters in Southeast Asia, Vol. 1: Overview of Repo*rt, January 1973, 2.
[25] Tactical Air Command (TAC) Syllabus Course F50000AIAN, *USAF Adversary Tactics Instructor Course F-5E*, Headquarters Tactical Air Command (TAC/DOT), Langley AFB, VA, May 1986, 5.

assigned. The student would prepare a research paper and briefing on the subject and continuously update these products with current information until he passed the topic on to his replacement when rotating out of the squadron. These subject matter experts would also teach academic classes at deployment locations when visiting operational fighter wings.

Educated by the Project RED BARON reports touting its benefits, TAC institutionalized the DACT concept in 1975 with its TAC Regulation 51-2, *Dissimilar Aircraft Air Combat Training*:

The fundamental objective of the dissimilar aircraft ACT [Air Combat Training] program is to prepare aircrews to enter the aerial combat arena and attain the highest possible success… This is best achieved by exposing aircrews to various simulated threat aircraft employing current enemy tactics.[26]

The initial concept envisioned the use of the Aggressors to provide a graduated program of basic DACT instruction. This program began with 1v1 air combat training engagements (one friendly aircraft versus one adversary aircraft) to teach Basic Fighter Maneuvers (BFM) against a dissimilar aircraft, then progressed to more complex engagements such as 2v1, 2v2, 2v4, etc., culminating in "many versus many" air battles. The stated goal was for the Aggressors to visit "every TAC base three times a year."[27]

In 1975, the Air Force again increased the realism of air combat training with the establishment of the RED FLAG exercises at Nellis AFB. This large, composite force exercise held on the vast Nellis range complex had a primary objective of exposing

[26] Tactical Air Command (TAC) Regulation 51-2, *Dissimilar Aircraft Air Combat Trainin*g, Headquarters Tactical Air Command (TAC/DOO), Langley AFB, VA, September 1975, 1.
[27] Ralph T. Browning, "Aggressor Training: Where Has It Gone? How to Get It Back," (student paper presented at the Armed Forces Staff College), Norfolk, VA, 1977, 3.

fighter crews to a realistic, yet controlled, simulated combat environment based on a Central European scenario. RED FLAG would expose TAF aircrews to their first ten combat sorties (albeit simulated) while contending with operational-level force sizes, the inherent "fog" of war, and a professional force of adversaries, the Aggressors. This training, based on the lessons learned in Vietnam, would act as a surrogate to fill the peacetime experience levels of aircrews with the ultimate goal of improving their chances of survival in actual combat.

The Aggressors formed the core of the "Red Forces" for RED FLAG exercises. Although occasionally augmented by other fighters to increase adversary-to-friendly ratios, the Aggressors were the "keepers of the rules of engagement (ROE)," providing a built-in safety valve that the RED FLAG commander could rely upon to defuse dangerous situations. Aircrews sometimes arrived at Nellis with a "must win" attitude; the Aggressors helped to temper that swagger with judgement.[28] The Aggressor charter in RED FLAG was to act as training aids; they had no motive to "win" every engagement, but instead to present a high fidelity representation of enemy capabilities.

To preclude aircraft from having to deploy to Nellis from bases in the Far East, PACAF later instituted its own version of RED FLAG, called COPE THUNDER, at Clark AB, Republic of the Philippines. The PACAF Aggressors served in the same role as those at Nellis. Because of the lack of adequate airspace in the European theater, USAFE combat squadrons participated in RED FLAG exercises at Nellis.

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[28] Colonel William Rake, USAF, Commander, 414th Combat Training Squadron (RED FLAG), Nellis AFB, Nevada, interviewed by author, 16 March 1998.

The First Transformation

In the 1980s, however, with the expansion of the USAF Tactical Air Forces (TAF)—36 fighter wing equivalents (FWE) growing toward 40—coupled with a rising demand on their services, there were simply not enough Aggressor assets to conduct basic DACT for all USAF fighter aircrews. The Aggressors represented one fighter wing equivalent (with 72 assigned aircraft) for a ratio of 36:1 front line combat aircraft for each Aggressor aircraft.[29] This meant that the TAC goal of visiting every fighter base three times per year was becoming difficult to attain.

By this period, participation in the RED FLAG series was consuming 17% of the annual Aggressor sortie allocation.[30] After allocating sorties for RED FLAG support, local Nellis support to Fighter Weapon School syllabi, tests and evaluations, and the Aggressor training syllabus, road show visits to TAF operational combat units consumed every remaining sortie. Because of the expanding fighter force, the additional demands on Aggressor sorties, and insufficient assets to provide a basic level of DACT to all TAC aircrews, the Nellis AFB representative to the 1984 TAC Aggressors Symposium recommended that "priority should be given to [Aggressor] tactics training found in larger scenario training instead of instruction in visual maneuvering air combat."[31] The outcome of this symposium, convened to examine the effectiveness of the Aggressors, marked the beginning of a transformation of the Aggressor program from the originally envisioned basic DACT to a graduate-level training program. Air Force fighter units

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[29] Headquarters Air Combat Command (ACC/XPPP), *Aggressor Plus-Up Outbrief*, (briefing presentation given at Nellis AFB, NV), Langley AFB, VA, 5 Mar 1998, 8.
[30] Rumohr and West, 4.
[31] John N. Phelps, "WSEP Lessons Learned," *USAF Fighter Weapons Review* (Summer 1986), 21.

were then encouraged to seek basic DACT with other types of aircraft to provide a work-up program in preparation for Aggressor visits and RED FLAGs.

As the TAF build up continued in the 1980s, the opportunity for DACT with units other than the Aggressors increased. With a wide variety and large numbers of fighter aircraft in the TAF, combined with plentiful fighters from the Navy and Marines, opportunities for dissimilar training abounded.

During the late 1970s, the Air Force introduced fourth-generation fighter aircraft into its inventory. The F-15A air superiority fighter came on line as a single role air-to-air combat fighter, representing a quantum advance in air-to-air capability over the F-4. Greatly improved maneuverability; state-of-the-art fire control systems providing look-down, shoot-down capability; and vast improvements in cockpit visibility and "switchology"[32] allowed the F-15 to outpace Soviet technology in aircraft such as the MiG-21 and Mig-23 class of fighters. Shortly following the emergence of the F-15A, came the F-16A, the follow-on replacement for the F-4 as the new dual-role fighter. Most of the F-15's improvements were also included on the F-16.

The F-15A, while a great improvement over the F-4 and Soviet aircraft of the 1970s, did have its limitations. The early version of its radar had blind zone and false target problems, and it carried only upgraded, albeit more capable, versions of the same air-to-air missiles carried by the F-4. The first F-16s had no long-range missile capability, carrying only the infrared-seeking AIM-9 short-range missile for self-protection and limited air combat capability. These limitations, while not severe, placed the latest U.S. aircraft on a roughly similar footing with new aircraft appearing in the Soviet inventory,

[32] Refers to improvements such as HOTAS (hands on throttle and stick) manipulation of weapons and fire control system switches without looking inside the cockpit.

such as the MiG-25, MiG- 29, and MiG-31. These fourth generation Soviet designs offered increased capabilities such as look-down, shoot-down, all-aspect missile employment, coupled with pulse-doppler radar systems comparable to systems carried on the F-15 and F-16. The new Soviet aircraft also represented a significant increase in maneuverability, now on par with the latest U.S. combat fighters.[33]

When DACT was not available with the Aggressors, USAF aircrews flew against other Air Force squadrons with different types of aircraft, as well as those of the U.S. Navy and Marine Corps. While neither side of such practice engagements routinely emulated Soviet aircraft and tactics, they could obtain experience merely through exposure to different aircraft and tactics, even if they were American.

The rough parity with newer Soviet aircraft meant that when DACT against dissimilar aircraft was unavailable, similar aircraft flying against each other were still able to achieve effective tactics training, even if one side was acting as the adversary. The result was "a 'Red Air' sortie was not much more restrictive than a 'Blue Air' sortie."[34]

The Second Transformation

As more new aircraft such as the SU-27 came into the Soviet inventory during the mid-1980s, the F-5E became less able to replicate accurately the threat that the modern Soviet designs represented. Although it was still able to provide faithful reproductions of

[33] Lieutenant Colonel Timothy Wolters, USAF, USAF Fighter Weapons School graduate and former F-15C squadron commander, Langley AFB, VA, interviewed by author, 24 March 1998.
[34] Ibid.

Soviet pre-merge[35] tactics, the F-5E could not replicate the advanced maneuvering of a Soviet fighter. The Air Force attempted to keep pace with Soviet advances by equipping the Aggressors with all-aspect heat-seeking missiles in order to approximate Soviet advances in missile technology, and by modifying the F-5E with a limited angle-track radar to more closely replicate newer Soviet fire control systems.

Several other factors combined to affect the role of the Aggressor organization. In 1988, the F-5E fleet began prematurely approaching the end of its service life. Expensive depot-level maintenance was required to maintain the serviceability of the aircraft into the 1990s.[36] The Air Force also found itself in the throes of a drawdown of aircraft and manpower. World events began to progress rapidly, with the fall of the Berlin Wall in 1989 portending an imminent end to the Cold War. A perceived reduction in the Soviet threat led to an accelerating military drawdown and reduced military budgets.

Despite geopolitical change, TAC continued to investigate the characteristics required for a replacement Aggressor aircraft. The command hit upon the scheme of using F-16s that were due to become surplus with the scheduled closing of the 474th Tactical Fighter Wing, an operational general-purpose combat wing based at Nellis. The F-16 was capable of emulating the current Soviet threat to a much greater degree than the F-5E; it had comparable maneuverability, fire control systems, and weapons emulation capabilities. However, the use of the F-16 as an Aggressor aircraft nullified the arguably greatest asset of the F-5E and the basis for the initial program concept: its dissimilarity with all other USAF combat aircraft. In addition, as F-16s began quickly replacing the aging F-4 fleet, a relatively larger percentage of the TAF would consist of F-16 wings,

[35] The "merge" is defined as when opposing fighter aircraft transition to visually maneuvering against each other vice maneuvering by radar or GCI information only.

exacerbating the similar aircraft problem. The success of the Aggressor program so far had stood on two pillars: the replication of enemy aircraft and tactics, and the training benefit received from practicing against dissimilar aircraft.

Senior TAC leadership was aware of this problem. Difficult fiscal decisions were imminent in making choices between maintaining combat versus training aircraft during the drawdown. Fiscal realities also precluded the acquisition of a dissimilar aircraft such as the Navy F/A-18 to act in the Aggressor role. TAC settled on a compromise decision of using the F-16 to keep the Aggressor concept alive, as "seed corn" for a possible future increased adversary training capability.[37]

In April 1989, the 64th Aggressor Squadron at Nellis converted to the F-16, while the 65th Aggressor Squadron ceased F-5E operations and deactivated. TAC designated twelve F-16s for the Aggressor role at Nellis. The F-16 Aggressors operated in the same manner as with the F-5E, although with far fewer aircraft and a much lower sortie generation capability. The syllabus for new Aggressor pilot training was cut to just eight sorties, with the F-16 RTUs providing transition training for non-F-16 pilots.[38]

The USAFE Aggressor squadron followed the same plan, converting pilots and aircraft in-place to F-16s acquired in the same manner as Nellis' aircraft. The PACAF Aggressors had initially planned to convert to the F-16, but the PACAF program was discontinued in early 1990 and the squadron deactivated, even as prospective pilots were at the F-16 RTU for training. The USAFE Aggressor squadron also permanently

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[36] Rumohr and West, ix.
[37] Major General Marvin R. Esmond, USAF, commander, USAF Air Warfare Center, Nellis AFB, Nevada, interviewed by author, 17 March 1998. General Esmond was the executive officer to the commander of TAC during the period under discussion.
[38] Tactical Air Command (TAC) Syllabus Course F1600XAIPN, *USAF Fighter Weapons Adversary Tactics Course*, Headquarters Tactical Air Command, Langley AFB, VA, 1988, 4.

deactivated shortly after PACAF discontinued its program. These deactivations were the result of accelerated force structure drawdowns; the combatant commands desired to maintain as much combat force structure as possible, deciding to close the Aggressor squadrons instead of front line units.

As the summer of 1990 approached, the Air Force became fully involved in the force structure drawdown. Consequently, TAC decided to inactivate its last Aggressor squadron, placing six F-16s under the Adversary Tactics division of the RED FLAG organization, the unit responsible for administration of the RED FLAG exercises. Before the squadron closed in October of 1990, the Aggressors made one last deployment in August to Eglin AFB, Florida, to help prepare the 33rd Tactical Fighter Wing's F-15C pilots for their deployment to the Persian Gulf during Operation DESERT SHIELD.[39]

TAC maintained the last vestige of the Aggressors, now known simply as adversary pilots, to continue providing the core adversary forces for the RED FLAG series of exercises, Fighter Weapons School course syllabi, and test and evaluation program support at Nellis. The adversary pilots have continued this level of operations until the present time, not deploying to an operational unit again until April 1997, nearly seven years after their previous road show.[40]

Decreased DACT Availability

As many USAF fighter wings and older weapons systems deactivated during the force drawdown toward the new goal of a 20 FWE force, DACT opportunities started drying up. As the Navy and Marines also began to drawdown their forces, the

[39] 64th Aggressor Squadron, *Aggressors: A Collection of Comrades*, (from a program for the 64th Aggressor Squadron closing ceremony, Nellis AFB, NV), 5 October 1990, 6.

opportunity to use their fighters for DACT dwindled considerably. Those services spent a large percentage of time preparing for deployments to sea and winding down afterwards; a smaller naval aviation force did not leave assets for them to engage in other training activities. The RED FLAG organization even had difficulty securing Navy and Marine units to participate for adversary support in the FLAG exercises, even when offering to pay their entire deployment costs.[41]

During the turbulent period for the Aggressor program that marked the turn of the decade, the Air Force was incorporating significant advances into the capabilities of the F-15C and F-16C fighters. The Multi-Stage Improvement Program (MSIP) gave the F-15C a generational leap in technology to a true multiple-target search and track radar, a "launch-and-leave" missile capability with the ability to employ the AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM), and a greatly improved Tactical Electronic Warfare Set (TEWS) with integrated countermeasures dispenser (CMD). These improvements, combined with the advent of RIVET JOINT reconnaissance aircraft providing real-time battle management information, Joint Surveillance and Target Attack Radar System (JSTARS) platforms providing the air-to-ground surveillance picture, and all integrated with the Joint Tactical Information Distribution System (JTIDS) for high speed secure data and voice communications, increased the sophistication of F-15C tactical employment.[42] The most significant improvement the F-16C received was the capability to employ the AIM-120, giving it a true beyond visual range (BVR) capability

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[40] Major General Marvin R. Esmond, USAF, commander, USAF Air Warfare Center, Nellis AFB, Nevada, letter, to All Aggressor Reunion Attendees, 21 August 1997.
[41] Rake.
[42] Wolters.

for the first time. The F-16C's tactics sophistication also increased due to the addition of BVR air-to-air employment doctrine.

An unintended consequence of these improvements in air-to-air capability showed itself in the realm of adversary training. Because the gap over Soviet technology widened so dramatically, no longer do F-15Cs playing the role of the "Red Air" adversary get effective training in their own tactical systems. In addition, even when engaged in DACT with non-dedicated adversaries such as the F-16C, practicing U.S. versus U.S. tactics leaves a dangerous gap in threat knowledge, and may prove to be negative training in the end.

The Gulf War

In stark contrast to Southeast Asia, the USAF air-to-air combat performance against the Iraqi Air Force in 1991 was spectacular. During the two-month war, USAF combat aircraft shot down 31 Iraqi third-, and fourth-generation fighters without a single air-to-air loss.[43] The fighter aircrews flying in the Gulf represented the training zenith of the extensive DACT programs in the Air Force throughout the 1980s. Almost to a man, "all the shooters in the Gulf War were the products of Nellis training, be they Fighter Weapons School graduates, former Aggressors, or in the least had many RED FLAG and Aggressor training sorties in their backgrounds. We simply cannot ignore this lesson of history."[44]

While the air combat experiences in the Gulf War may constitute a small sample size from which to draw conclusions, the air attaché assigned to Baghdad just before the Gulf

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[43] James P. Coyne, *Airpower in the Gulf*, (Arlington, VA: Air Force Association, 1992), 51.

War related personal observations of senior Iraqi Air Force officers' perceptions of U.S. airpower capabilities: "The Iraqi Air Force was a very capable force, during their war with Iran they routinely delivered [precision-guided munitions] PGMs at night with great success, they were no slouches. However, they knew they were hopelessly overmatched by the U.S. Air Force, especially with our realistic training."[45]

Do the combat aircrews of today's Air Force have the same capabilities in the air combat arena as the aircrews that fought the Gulf War? As the need for dedicated adversary air training was increasing due to reduced DACT opportunities and increased U.S. aircraft and tactics sophistication, the Air Force reduced the size of its Aggressor force by 92%. This reduced adversary air training capability has been in effect for nearly eight years, the span of a generation of fighter aircrews when measured from RTU graduation to their first out-of-cockpit staff assignment. How is current adversary air training satisfying the DACT and other training needs of the present day combat air forces (CAF)? Since the Gulf War, a new national security strategy for the 1990s has evolved that details military force to crises and hotspots around the globe. The next chapter will examine the effect on air combat training as the Air Force's vastly reduced dedicated adversary air training capability combines with the challenges of the new national security strategy.

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[44] Colonel Ricardo Cazessus, USAF, vice commander, 57th Wing, Nellis AFB, Nevada, interviewed by author, 17 March 1998.

[45] Colonel Charles Westenhoff, USAF, former air attaché to Baghdad, Iraq, and director, Commander's Action Group, USAF Air Warfare Center, Nellis AFB, Nevada, interviewed by author, 17 March 1998.

Chapter 3

Adversary Training Today

> *It is widely known and understood that both the USAF and the U.S. military are much smaller than they were at the end of the Cold War, or during the 1991 Gulf War. What is less widely appreciated is that extensive commitment of USAF personnel to peace operations in the years since the Gulf War ended has come largely* ***at the expense of high-quality training time*** *[emphasis added].*
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> *Allan Vick, et al.*

Preparing the U. S. Air Force for Military Operations Other Than War

The USAF dedicated adversary air training capability of today is far less than that of a decade ago. When TAC closed the last USAF Aggressor squadron at Nellis AFB in 1990, the remaining Air Force adversary training forces were 92% smaller than the previous level of the 1980s. The remaining capability is unable to provide the level of training required to maintain sufficient air combat proficiency in the combat air forces (CAF).

The Adversary Tactics (AT) division of the 414th Combat Training Squadron (RED FLAG) at Nellis AFB embodies the aircraft and pilots that represent the Air Force's former Aggressor organization. AT has six Primary Mission Aircraft Inventory (PMAI) F-16Cs assigned, plus three Backup Aircraft Inventory (BAI), and four Attrition Reserve (AR) F-16Cs. However, these BAI and AR aircraft are currently unfunded both in flying

hours and in maintenance support. The division can normally generate a maximum of eight sorties per day, four per flying period. This gives AT an annual generation capability of approximately 1,660 sorties.[46]

The parent unit for the 414th, the 57th Wing, has prioritized the types of sorties for the Adversary Tactics division as 1) RED FLAG exercise support, 2) Weapons School syllabus support, and 3) DACT support for Air Combat Command (ACC) operational squadrons.[47] Under this guidance, the approximate AT sortie allocation breakdown for FY98 is 1) RED FLAG – 950 (57%), 2) Weapons School – 250 (15%), DACT at ACC fighter bases – 200 (12%), with the remainder (16%) used for Adversary Pilot upgrades and other continuation training requirements. This last category also includes support for short notice higher headquarters taskings such as airpower demonstrations and air show static displays.

RED FLAG

The current RED FLAG exercise program at Nellis is much the same as that of the 1980s. Based upon the employment of large, composite forces, the focus of the program remains on the employment of airpower in a major theater war (MTW). Following the end of the Cold War, the 57th Wing updated the exercise scenarios to reflect possible theater conflicts in North Korea and the Middle East; it is beginning to implement scenarios to simulate Air Expeditionary Force (AEF) deployments to smaller-scale contingencies (SSC).[48]

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[46] Major Steven Imonti, USAF, 414th CTS/AT operations officer, (from an Aggressor briefing given to the author), Nellis AFB, NV, 16 March 1998. All AT flying hour program numbers in this chapter are from this briefing unless otherwise specified.
[47] Ibid.
[48] Rake.

Under guidance from Air Combat Command, adversary aircraft in RED FLAG exercises must outnumber the "Blue Air" (friendly) fighters flying in an air-to-air role by a ratio of at least 1.25 to 1.[49] While this ratio is a remnant of Cold War planning, it remains valid as AEF combat aircraft could find themselves locally outnumbered in SSC situations. As the Blue forces in a RED FLAG generally field an air-to-air fighter force of eight to ten aircraft, this requires adversary forces of ten to twelve aircraft for each of two daily RED FLAG flying periods. The ACC-estimated annual adversary sortie requirement for the RED FLAG series is approximately 2280, based on the above 1.25:1 force ratio.[50] Based on its current capability and sortie allocation guidance from the 57th Wing, the AT division schedules approximately 950 annual RED FLAG sorties. This leaves a significant sortie shortfall for RED FLAG exercises that requires units from outside the 57th Wing to augment with their own aircrews and aircraft. During the 1980s when the 57th Wing had two Aggressor squadrons, it was normal to allocate twelve to fourteen Aggressor sorties to each RED FLAG flying period.[51] At that time, although augmenting Red Forces with non-Aggressor aircraft and aircrews occasionally occurred during periods of heavy Aggressor tasking for other missions, it was not the normal procedure.

When today's RED FLAG planners cannot obtain adversary augmentation from Navy, Marine Corps, or allied air force fighter units, they task other USAF fighter units through ACC to participate as adversaries. Flying as adversaries in RED FLAG restricts the effectiveness of the training received by augmenting units. Augmenting adversary

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[49] Headquarters Air Combat Command (HQ ACC/XPPP), *Aggressor Plus-Up Outbrief*, briefing charts, Langley AFB, VA, 5 March 1998, 9.
[50] Ibid.

aircrews must restrict their tactics and weapons employment to an approximation of threat aircraft and tactics. The aircrews are then unable to train in their own weapon system tactics and weapons employment, decreasing aircrew proficiency in air combat. Deploying aircrews and aircraft to Nellis also increases the operations tempo for a force already stretched thin by the demands of constantly increasing operational commitments. In addition, the fidelity of emulation of enemy aircraft and tactics by augmenting units is not as high as from the AT pilots, merely because of the Aggressor unit's focus and extensive training on enemy capabilities and tactics.[52]

The RED FLAG scenario is purposefully demanding in order to expose combat air forces (CAF) aircrews to the large unit activity and realistic threat environments they will likely face in a future conflict. However, the Aggressors are adept at modulating the intensity and complexity of simulated enemy tactics as required to meet the needs of aircrew training on the Blue side. This has the added benefit of acting as a safety valve to prevent a crowded and highly complex air battle from degenerating into a dangerous situation.[53]

Using non-AT units to augment adversary training in RED FLAG exercises has major ramifications for air combat proficiency in the CAF. The Adversary Tactics Division's capability to support only 42% of the annual RED FLAG adversary sortie requirements levies additional deployment requirements on CAF fighter units at a time when operations tempo is very high. In addition, flying as "Red Air" (adversary) limits

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[51] From the author's personal experience as a member of the 65th Aggressor Squadron, 1986-1988.
[52] Lieutenant Colonel Dale Burton, USAF, Commander, Adversary Tactics Division, 414th Combat Training Squadron, Nellis AFB, Nevada, interviewed by author, 18 March 1998.
[53] Cazessus.

the effectiveness of training in the adversary augmentee's primary employment tactics, causing a disincentive to his participation in the exercise. If the 57th Wing cannot maintain sufficient adversary-to-friendly aircraft ratios for the RED FLAG exercises, operational units flying in the Blue Air role will not be challenged sufficiently to preserve a high level of air combat proficiency.

Weapons School Syllabus Support

The USAF Weapons School (formerly USAF Fighter Weapons School) conducts two classes per year of graduate-level weapons and tactics training in the Air Force's major weapon systems. To provide the maximum effectiveness for the air-to-air combat phases of its training, the school has an annual DACT requirement of approximately 5,550 sorties.[54] The Adversary Tactics Division's present capability of providing two hundred fifty sorties per year represents a contribution to the Weapons School of less than 5% of the DACT sorties required by the School. While units already deployed to Nellis for RED FLAG or other flying support will occasionally fill some of these sortie requirements, the vast majority of flying units are brought in specifically to support the various Weapons School syllabi.

The pressures of operational commitments are mounting on combat units throughout the CAF. Because of increased taskings, the 33rd Fighter Wing from Eglin AFB, Florida recently canceled a deployment to a RED FLAG exercise, citing an inability to attend and continue to meet its operational commitments.[55] RED FLAG Blue Air missions provide some of the most realistic and beneficial training, especially for inexperienced aircrews.

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[54] 57th Operations Support Squadron, *FY 98 Adversary Support Requirements*, spreadsheet, Nellis AFB, NV, 5 March 1998, 3.

Conversely, Weapons School adversary support missions provide far less effective training for weapons system employment practice; RED FLAG cancellations by operational units may portend future difficulty in securing adversary assets for Weapons School support.

The effectiveness of the training that adversary aircrews receive while flying adversary missions for the Weapons School varies with the weapons system type and course phase. However, most adversary aircrews have some restrictions placed on them by Weapons School syllabi that degrades the training they will receive in their own primary employment tactics. For example, F-15C units that provide Red Air support fly against less capable air-to-air platforms, follow scripted profiles, or perform simple intercepts where very little training occurs for the adversary aircrew. According to a former F-15C squadron commander, "None of these [Weapons School adversary] sorties allow the F-15C to employ their weapons, radar, or TEWS [tactical electronic warfare set] to their full capabilities."[56] In addition, the increasingly scarce adversary support at an operational unit's own home station has caused greater demand in flying as their own Red Air, further reducing their desire to fly in that role for the Weapons School.

In most cases, flying as adversaries against other operational units with dissimilar aircraft usually allows for taking turns flying in the Red Air role, operational aircrews can then receive effective training as Blue Air in at least half the sorties or engagements. However, this is not so with Weapons School support because adversaries must fly the Red Air role for their entire stay at Nellis. The 57th Wing commander, Brigadier General Theodore Lay III, wrote that "The assumption that everyone wants to come to Nellis to

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[55] Burton.
[56] Wolters.

train is right on except they want to come to RED FLAG, not act as bandits [adversaries] for our schools. As an operational wing CC [commander] before this, I can tell you that flying as Red Air isn't any better at Nellis than at Langley."[57]

The prominent exception to this training effectiveness predicament lies with the pilots of the Adversary Tactics Division. Providing a professional, high fidelity presentation of enemy aircraft, tactics, and capabilities is the essential sustaining element of the Adversary Pilot trade. According to Lieutenant Colonel Dale Burton, current commander of the Adversary Tactics Division, Weapons School instructors "can count on the Aggressors to consistently provide Weapons School students with precise enemy formations, tactics, and weapons employment, as required, from one training engagement to the next."[58] However, because of their "non-dissimilarity" from the aircraft in the F-16 Division, the largest Weapons School division, the Aggressors can provide only limited support to the F-16 Weapons School syllabus in its Tactical Intercept and Air Combat Maneuvering (ACM) phases.[59]

At their current low level of support for the Weapons School, the Adversary Tactics Aggressors provide little assistance in meeting the requirements of the School for DACT. CAF units that must provide adversary support therefore face an increased operations tempo, while receiving little in return in the form of effective air combat training.

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[57] Brigadier General Theodore W. Lay III, commander, 57th Wing, memorandum to Brigadier General Daniel M. Dick, director of plans and programs, Air Combat Command, subject: Aggressor Force Structure Request, 5 February 1998.
[58] Burton.
[59] 57th Operations Support Squadron, 2.

ACC Operational Squadrons

During the 1980s, the priorities for the Aggressor sortie allocation were nearly the opposite of those for the present program. As late as 1988, the first sortie priority was the Adversary Tactics Instructor Course (for training new Aggressor pilots) for program self-sustainment, followed by support to operational fighter squadrons, and finally, adversary support to RED FLAG, Fighter Weapons School, and other Nellis requirements.[60] Presumably, the abundance of Aggressor assets rarely forced agonizing decisions concerning priority of support. However, the order of priorities noted above gives an indication as to the perceived level of importance of the various Aggressor missions.

The present sortie allocation and capability of the Adversary Tactics Division limit them to only two two-week deployments to an operational combat unit annually, with a limited employment of eight Aggressor sorties per day, four per flying period. Because of the severe reduction in adversary forces, the current operational aircraft (20 FWE) to adversary aircraft (.08 FWE) ratio of 240:1 has risen by nearly an order of magnitude from the mid-1980s when it was 36:1.[61] This increased ratio has severely limited the adversary training for USAF combat aircrews.

Another major limiting factor in the current program is that AT has no funds for deployment travel other than those earmarked for the annual MAPLE FLAG exercise, a version of RED FLAG held in Canada. Consequently, the visited operational unit must provide the travel funds. With the current austere budget environment in the Air Force combined with many operational commitments, operational units find themselves lacking

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[60] See note 6.

[61] Headquarters Air Combat Command (ACC/XPPP), *Aggressor Plus-Up Outbrief*, (briefing presentation given at Nellis AFB, NV), 5 March 1998, 8.

funds to host Aggressor deployments. As noted in Chapter 2, the F-15C has the most urgent requirement for dedicated adversary air training; AT has only deployed to one operational F-15C base since starting unit deployments again in 1997.[62]

Increasing Operations Tempo

Since the end of the Gulf War, the U.S. has undergone a shift in its foreign policy and national security strategy that has resulted in an increase in military intervention in conflicts and crises around the globe. Much of this activity is in the form of military operations other than war (MOOTW). While MOOTW can consist of missions as diverse as disaster relief, humanitarian aid, and foreign internal defense, the largest number of operations affecting the USAF has been peace operations. Although representing only 9% of the total number of MOOTW actions, peace operations have consumed 90% of the sorties flown. Since 1991, the USAF has flown over 142,000 sorties of all types in peace operations. USAF fighter aircraft, mostly in support of no-fly zones over the Balkans and Iraq, have flown over 50% of these sorties.[63]

The severe drawdown in the number of USAF aircraft and personnel since the end of the Gulf War, coupled with the prolonged nature of these peace operations, has resulted in a significant increase in the demands placed on the remaining operational units. This high operations tempo presents problems in many areas. Of particular concern to this study is that while participating in these operations, fighter aircrews have little or no opportunity to practice the tasks they require to maintain combat proficiency. A recent RAND study examining this phenomenon concluded “relative to the forces that fought

[62] Imonti.

and won the Gulf War, today's Air Force is both smaller and, on average, less proficient at basic combat tasks. The extent of the qualitative difference and its implications are difficult to judge but potentially serious."[64] If an important part of air combat proficiency is fulfilled with DACT, then deployments to RED FLAG or other locations to secure that training come at the price of increasing an already high operations tempo for CAF squadrons.

Ready Aircrew Program (RAP)

In an attempt to link closely the requirements of the theater commander-in-chief (CINC) with flying training, the CAF commanders overhauled the USAF combat aircrew continuation training environment by establishing the Ready Aircrew Program (RAP). Instituted in 1997, this program more closely aligns with joint train-to-task guidance and improves the process of allocation of flying hours to operational squadrons. The goal of RAP is to increase the quality of flying training by allocating the required flying hours, funds, and aircrew, when necessary, to operational unit commanders.[65]

One of the tools RAP uses to track combat proficiency is a process for monitoring and limiting the number of Red Air sorties an aircrew member flies. An aircrew member exceeding a certain percentage of total sorties with Red Air sorties could regress from the status of fully Combat Mission Ready (CMR) to that of Basic Mission Capable (BMC), causing a subsequent downgrade in a unit's readiness status. The percentages that trip

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[63] A. Vick, et al., *Preparing the U. S. Air Force for Military Operations Other Than War*, (Santa Monica: RAND, 1997), 14, 24.
[64] Ibid., 37.
[65] Headquarters Air Combat Command (HQ ACC/DOT), *Ready Aircrew Program*, briefing charts, Langley AFB, VA, 3 June 1997, 10-11.

this regression are dependent on aircraft type. For example, an inexperienced[66] CMR F-15C pilot may fly only thirty-six Red Air sorties against an annual per-pilot RAP requirement of fifty-one sorties that require Red Air support. This leaves fifteen sorties requiring dedicated adversary support. For an experienced CMR pilot, the requirement is thirty-six against forty-two annual sorties, leaving six required adversary sorties.[67] There is no minimum requirement specified for DACT sorties, only a maximum as Red Air, whether similar or dissimilar.

Because of their multi-role missions, F-15E and F-16C aircrews have a lower allowed maximum of Red Air sorties which is commensurate with their lower air combat training requirements. However, their multi-role character allows them to register required air combat proficiency sorties when flying against aircraft that are on surface attack missions, whether similar or not. Consequently, they do not have the same shortfall in dedicated adversary sortie requirements as the F-15C.

Totaling the number of F-15C CMR aircrews in the CAF and multiplying by the annual sortie requirements results in 11,386 sorties required to maintain air combat proficiency. After subtracting from this number the maximum allowable Red Air sorties (8,712) for these CMR aircrews, 2,674 sorties remain to be filled with adversary sorties from outside CMR F-15C squadrons.[68] According to an internal ACC memorandum, the net result of this shortfall is "F-15C units will exceed the 36 sortie [Red Air] limitation

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[66] Aircrews are designated "experienced" or "inexperienced" based upon flying hours logged in their major weapon system. For fighter aircrews, the "experienced" designation normally comes after 500 flying hours or 300 hours if they have previous non-fighter flying experience.

[67] Message, Headquarters Air Combat Command (HQ ACC/DOT), to [all ACC F-15C/D units], subject: ACC F-15 C/D READY AIRCREW PROGRAM (RAP), 1 JUL 97 - 30 JUN 98, 11 June 1997.

[68] Headquarters Air Combat Command (HQ ACC/DOTO/XPPP), *Aggressor Requirements and Plus-Up Options*, briefing charts, Langley AFB, VA, 16 March 1998, 5.

due to lack of DACT assets, and since this comes out of the total sortie/flying hour allocation of the unit, the impact is to other training required for CMR pilots."[69]

Annual RAP requirements obscure another problem. The requirements appear easy to spread out on an annual basis, but in practice, they can be compressed in time. On many occasions, operational wings have one squadron return from a contingency location only to have another deploy within several months. The time that passes between these deployments can cause a flurry of activity to accomplish recurrency flights, mission qualification training, and flight lead or instructor pilot upgrades. If an aircrew is not in one of these programs as either the trainee or the instructor, it tends to fly a disproportionate number of Red Air sorties. Dedicated adversary training support is critically important during these fast-paced training periods.[70]

Notwithstanding DACT support to other fighter aircraft, the current Adversary Tactics Division's provision of approximately two hundred sorties annually in support of ACC operational squadrons can fill less than 10% of the yearly Red Air shortfall for CAF F-15Cs alone. In an explicit institutional admission, the RAP conveys the message that Red Air missions provide training of limited effectiveness for operational fighter aircrews, especially for single-role air superiority fighter pilots. Although highly capable and experienced, AT's adversary pilots do not fall under RAP CMR restrictions because of their mission support role. Increasing their use in the Red Air role has the effect of returning Blue Air sorties to the operational squadrons they are supporting.

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[69] Headquarters Air Combat Command (ACC/DOT), memorandum to ACC/XPP, subject: 57WG Aggressor Request, 14 January 1998.
[70] Wolters.

Observations

Training effectiveness and air combat proficiency are more than the result of meeting arbitrary annual sortie and event requirements. The reduction in the Aggressor program, coupled with reduced DACT engagements and increased deployments to contingencies without training opportunities, have created an environment not unlike the Air Force of the early 1960s. The pre-Vietnam U.S. Air Force was not well-trained nor proficient in air-to-air combat, although for doctrinal reasons rather than dearth of opportunity. Lack of DACT, however, also contributed to limited aircrew abilities against dissimilar adversaries, borne out in the skies over Southeast Asia.

Today's USAF fighter aircrews, although having received some DACT, resemble the fighter aircrews of pre-Vietnam more than the ones of pre-DESERT STORM. Anecdotal evidence confirms this impression. A recent Aggressor deployment to an F-15C operational unit revealed an F-15C wingman that, although he had accumulated 300 hours experience, had not only never flown against an Aggressor, he had not even flown DACT against an F-16.[71] Another anecdote revealed that an F-16 squadron commander was recently attending only his second RED FLAG exercise.[72] In the early 1980s, it was not unusual for a new fighter pilot to attend four RED FLAGs in his first two years in a fighter squadron, in addition to several other deployments to Nellis for Weapons School or Aggressor syllabus support. He was also likely to have experienced an overseas deployment, filled with intensive air combat training, to either the European or Pacific theaters, if stationed in the continental United States.[73]

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[71] Burton.
[72] Ibid.
[73] Ibid., and the author's personal experience.

The limited training opportunities available to today's fighter aircrews require that each event provide the maximum in training effectiveness. According to the 57th Wing commander, Brigadier General Lay, "we have seen a significant decrease in capability of units and individuals in Weapons School and RED FLAGs because we are not training as we did [even] six or seven years ago. Some of this is the time we spend in the Desert [sic] drilling holes and making people experienced in orbits but not engagements and part is because they develop bad habits flying similar [air combat training] every day."[74]

Thus far, this paper has been limited to USAF dedicated adversary air training as it relates to training deficiencies present in the current Air Force environment. The next chapter will examine how the primary Soviet threat of the Cold War has evolved into the current and projected near-term threat environment. Projected USAF operations in this threat environment, within the growing doctrinal trend of Air Expeditionary Force employment, will be investigated as to their requirement for dedicated adversary air training.

[74] Lay.

Chapter 4

The Evolving Threat Environment

> The greatest threat to America today is not Iraq, Iran, North Korea, terrorism, or weapons of mass destruction. It is the potential that we will become too complacent [in our training] during this time of peace.

General Henry Shelton

Chairman of the Joint Chiefs of Staff

The value the Aggressor concept had in training USAF fighter aircrews for success in air combat against a dissimilar adversary was only half of the equation; the remaining significance was of training USAF combat aircrews to defeat the specific air capability of America's foes. Although initially conceived as a result of combat against the North Vietnamese Air Force, the premise of the Air Force's Aggressor concept was fundamentally aimed at exploiting the knowledge of and neutralizing the aircraft, employment tactics, and operational doctrine of the Soviet Union.

From the end of the Vietnam War in 1975 until the fading of the Cold War circa 1989, the nature of the Soviet threat in Central Europe drove the Aggressor program to expand dramatically. The North Atlantic Treaty Organization (NATO) faced numerically superior forces following a conventional arms buildup by the Soviet Union and their Warsaw Pact collaborators. The threat posed by large Soviet bloc air forces provided the incentive for the U.S. and NATO to rely increasingly on a qualitative edge in both aircraft and tactics in order to prevail in combat. The Aggressors contributed to this

increase in quality by presenting the latest information on Soviet equipment, tactics, and employment doctrine to USAF operational fighter units.

The Aggressors, while preoccupied with the air forces of the Soviet Union and Warsaw Pact, did not ignore other threats around the world. Members of the Aggressor squadrons attended threat analysis team conferences in the European, Pacific, and Caribbean theaters to cull as much information as possible from new intelligence reports on the USSR, the Middle East, East Asia, and Cuba. These conferences, attended by operations and intelligence specialists gathered to analyze intelligence information, allowed the Aggressors to incorporate the latest observations into their repertoire of adversary tactics and academics. Aggressors also actively monitored all Soviet client states to determine how their air forces modified and employed Soviet aircraft and equipment. In addition, the Aggressors maintained an interest in the air force of the People's Republic of China. Although Chinese aircraft consisted mainly of older Soviet technology or domestically built copies, their large numbers could pose a significant threat to the USAF in the Western Pacific region.

Finally, the Aggressors also watched the development of "gray"[75] threats, states whose interests may have been incompatible with those of the U.S. and its allies, and who possessed a combination of Eastern and Western aircraft and employment doctrine. The Aggressors maintained information on aircraft and tactics of any type or origin that might have been employed against USAF combat forces in any future conflict. This policy bore fruit when the F-16 Aggressors replicated the potential threat posed by Iraqi Mirage F-1s during a special DESERT FLAG held at Nellis AFB in the fall of 1990.[76] USAF fighters

[75] "Gray" means neither "Red" (known adversary) nor "Blue" (known friendly).
[76] James Kitfield, "Demise of the Aggressors," *Air Force Magazine*, August 1992, 42.

subsequently shot down six Iraqi F-1s during the first ten days of Operation DESERT STORM.[77] The Iraqi's French and Soviet aircraft and tactics, combined with Soviet-style command and control, overlaid a robust Third World air force—a Soviet client, however, unlike any Warsaw Pact military force. The specter raised by the emergence in combat of this "gray" threat portended the characteristics of the air threat situation in the post-Cold War world.

Post-Cold War Threat Environment

With the fall of the Berlin Wall in 1989, followed within two years by the reunification of Germany and the dissolution of the Soviet Union, the range of possible adversary air capabilities facing the Aggressors appeared first to contract, then suddenly expand dramatically. The global threat to the U.S. and its allies diminished substantially with the breakup of the Warsaw Pact and Soviet Union. Still, the political and military landscape became much more complex and capricious and it appears that it will remain that way for some time. As Lieutenant General Patrick Hughes, Director of the Defense Intelligence Agency, noted in January 1998:

The turmoil and uncertainty that have characterized international affairs since the end of the Cold War will last at least another decade. During this transition period, the United States will continue to face a dynamic, complex, and uncertain security environment. The "bi-polar" (Cold War) security framework has given way to a more generalized global set of partners, competitors, and potential adversaries, the troubling

[77] Coyne, 51.

proliferation of "negative" technologies, and the advent of numerous persistent small-conflict circumstances.[78]

The combat aircraft and tactics facing the Aggressors did not "dissolve" along with the Soviet Union. Many former Soviet republics inherited the airpower assets that were deployed in their country when the break-up of the USSR occurred. Some Soviet pilots also remained and became citizens of the newly independent republics. Belarus, for example, inherited its fleet of SU-27 aircraft through these circumstances.[79]

There remains a substantial airpower threat possessed by many countries throughout the world. The spread of state-of-the-art combat aviation technology is beginning to grow with advances in information technology. The possibility of advanced aircraft arrayed with overwhelming force against a limited contingent of U.S. forces could offset any American technological superiority. As noted in the discussion on DACT, understanding the capabilities of aircraft that U.S. forces could face in combat is crucial to success in a future conflict. An inventory of potential air threats from around the world follows.

Non-NATO Europe

This region consists mainly of former Warsaw Pact members, former republics of the Soviet Union, the Transcaucasus, Cyprus, and the Balkans. The air threat consists mainly of the transfer from former Soviet republics of their newly acquired air assets to nations not friendly to the U.S. For example, the Republic of Moldova inherited a squadron of

[78] Lieutenant General Patrick M. Hughes, USA, Director, Defense Intelligence Agency, "Global Threats and Challenges: The Decades Ahead, Statement for the Senate Select Committee on Intelligence," 28 January 1998, on-line, Internet, 21 Mar 98, available from http://www.dia.mil/dr_ssciu.html.

MiG-29s following the dissolution of the USSR. Moldova, as with most former Soviet republics, was in dire economic straits that necessitated innovative methods of raising capital. Sensing an opportunity to acquire advanced aircraft, Iran began courting Moldova. In this instance, the U.S. stepped in and instead purchased the MiG-29s to keep them out of the hands of unfriendly nations like Iran.[80]

The former Yugoslav Air Force assets of Serbia in the Balkans pose a significant threat to United Nations and U.S. peace operations in the region, fielding nearly three hundred third-, and fourth-generation combat aircraft such as the MiG-21 and MiG-29.[81]

Former Soviet republics such as Ukraine and Belarus maintain significant modern air forces totaling nearly twelve hundred combat aircraft and both have signed defense pacts with Russia.[82] These pacts again raise the possibility of facing these nations in league with Russia in a future conflict in Central Europe.

Russia

When the Soviet Union dissolved in 1991, the Russian Federation lost not only a great deal of its political influence, but a large portion of its airpower as well. Notwithstanding the loss of many front line aircraft to the seceding republics, Russia still operates more than three thousand fighter aircraft as well as more than two hundred long-, and medium-range bombers. However, Russia's air force is suffering from severe

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[79] Major Aleksandr Zhuravlevich, Belarus Air Force, interviewed by author, Maxwell AFB, AL, May 1997.
[80] Steven Lee Myers, "U.S. Buying MiGs so Rogue Nations Will Not Get Them," *New York Times*, 5 November 1997.
[81] Unless otherwise specified, all aircraft and country data in this chapter are from United Communications Group, Inc., *Periscope U.S. Naval Institute Military Database*, 1998, on-line, Internet, 29 March 1998, available from http://spock.au.af.mil/bbs/usni/.
[82] The International Institute for Strategic Studies, *The Military Balance 1997/1998*, (London: Oxford University Press, 1997), 302.

funding restrictions, as are the rest of its military forces. One source characterizes the air force as critically short of spares and less than half of Russia's military aircraft as fully serviceable, placing, among other things, severe limits on flying training.[83] However, Russia's military procurement as well as foreign arms sales remain high compared to the level of all nations, except the U.S. Between 1990 and 1995, Russia exported three hundred seventy supersonic combat aircraft to Moscow's former clients in North Korea, Cuba, and Libya.[84] The revenue generated for Moscow from these exports continues to fund research and development, and modernization programs.[85]

Middle East and North Africa

This region is arguably one of the most politically and militarily unstable on the earth. The territory, extending from Morocco to Iran, retains its Cold War status as the largest arms market in the world for major conventional weapons systems, with the Persian Gulf states accounting for approximately half of defense expenditures. These expenditures continually exceed estimates as the oil-producing states take advantage of higher oil prices to fund expensive weapons systems.[86]

Iran, for example, continues to develop a domestic defense industrial base, increasing its defense expenditures by 40% from 1996 to 1997.[87] Nearly sixteen hundred combat aircraft of third-, and fourth-generation capability are located in this region in countries either indifferent or openly hostile to the United States.[88]

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[83] Ibid., 102.
[84] U.S. Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers 1996*, (Washington, DC: GPO, 1996), 168.
[85] Ibid., 104.
[86] The Military Balance 1997/1998, 115-117.
[87] Ibid.
[88] Ibid., 121-144.

Central and South Asia

The former Soviet Central Asia republics together with Afghanistan suffer from continual internal unrest driven by Islamist or ethnic opposition groups. Relations between India and Pakistan remain tense, especially in light of the resumption of Indian nuclear weapons testing.[89] Both countries' very capable air forces bring the total number of combat aircraft in Central and South Asia to 1,250.[90] India is significantly upgrading its air combat capabilities with the latest models of the Russian SU-27, designated the SU-30 and SU-37.

People's Republic of China (PRC)

China's Peoples' Liberation Army Air Force (PLAAF) is the largest in the world, operating nearly forty-five hundred fighter or medium bomber aircraft. While equipped primarily with aging, less capable Soviet aircraft or domestically produced copies of the same, the PLAAF has embarked on a major modernization program. China purchased outright twenty-four SU-27s from the USSR in 1991 and took delivery of an additional twenty-two in 1995.[91] In February 1996, Beijing entered into a partnership agreement with Moscow to begin producing the SU-27 combat fighter in China.[92] While details of the co-production deal vary with the source, the Chinese could produce as many as three hundred of these very capable fighters.[93] Assisted by aviation and manufacturing technology provided by U.S. allies such as Israel, China is also developing another

[89] Kenneth J. Cooper, "Indian Minister Warns Pakistan," *Washington Post*, 19 May 1998.
[90] The Military Balance 1997/1998, 145-163.
[91] "'Made in China' Deal is Forged for SU-27s," *Jane's Defence Weekly*, 6 May 1995, 3.
[92] David A. Fulghum, "China Buys SU-27 Rights From Russia," *Aviation Week and Space Technology*, 12 February 1996, 60.

advanced fighter aircraft of its own, the J-10, roughly equivalent to the U.S. Navy and Marine Corps' s F/A-18.[94] For the first time, the PRC is approaching rough technological parity with U.S. combat aircraft.

East Asia

The most significant air threat in East Asia (outside of China) remains North Korea. In spite of recent moves toward a long-lasting peace settlement on the Korean Peninsula, South Korea still regards the North as a major threat, as evidenced by Seoul's increasing defense expenditures.[95] The Communist North boasts an air force of over six hundred combat aircraft, composed mostly of Vietnam-era Soviet designs but including some fourth-generation fighters. Despite the age of much of its air force, North Korea poses a significant threat to its southern neighbor, along with U.S. forces and interests on the peninsula.

Caribbean and Latin America

This region has long been marked by guerrilla warfare and insurgencies, but of late has been plagued by internal struggles tied to drug trafficking. The U.S. has become increasingly involved with air surveillance missions to assist in anti-narcotics smuggling efforts. The primary air threat in the region remains Cuba, though only 15% of its air force of 130 modern combat aircraft are estimated to be operational because of the loss of

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[93] William Gertz, "Chinese Arms Buildup Increases Attack Range," *Washington Times*, 12 March 1996.
[94] Charles Bickers and Nick Cook, "Russia, Israel Helping China Build New Fighter," *Jane's Defence Weekly*, 25 November 1995, 4.
[95] The Military Balance 1997/1998, 165-67.

its military benefactor, the Soviet Union.[96] As one of the last bastions of failing Communism, Cuba has the potential to come apart politically and economically, possibly violently, where U.S. intervention forces could face Cuba's air force in a future conflict.

The New "Gray" Threats

The "gray" threats of the 1970s and 1980s consisted of the air forces of countries whose intentions towards the U.S. were largely unknown or unpredictable. These air forces operated aircraft from the Soviet bloc, the West, or a combination of both. However, in the decade of the 1990s this threat has evolved to include hybrid combinations of older airframes with newer technologies. There are many older combat aircraft still in service with the air forces of the smaller nations and developing countries of the world. The upgrading of older aircraft with newer weapons and avionics forms these new "gray" threat aircraft variations. According to a former arms control research assistant at the University of Illinois, these upgrades, when applied to proven airframes, "substantially enhance fighter capabilities for very reasonable costs. The resulting aircraft are vastly superior to their original configurations, and pose a new kind of threat."[97] Private industries now offer significant upgrade packages to older aircraft such as the F-5E and MiG-21 series of fighters. The U.S. widely exported the F-5E in the 1970s and 1980s; more than eighteen hundred such aircraft in several variations are still in service in twenty-six countries. The venerable MiG-21 (still around to haunt the descendants of the original Aggressors) was exported for more than three decades by the

[96] Ibid., 215.
[97] James Cunningham, "The New Old Threat: Fighter Upgrades and What They Mean for the USAF," *Air Chronicles*, on-line, Internet, 16 May 98, available from http://www.cdsar.af.mil/cc/jimc.pdf, 2.

Soviet Union; over three thousand (including the Chinese J-7 version) are still in service in thirty-five countries.

The upgrade packages for these fighters can include fire control systems with pulse-Doppler, look-down, shoot-down radars, the capability to employ all the latest versions of air-to-air missiles (including active-homing radar variants), heads-up display systems, modern instrument display cockpits, inertial and Global Positioning System (GPS) guidance systems, precision-guided munitions capability, helmet-mounted sight systems, and even engine replacements that can significantly increase fuel efficiency and thrust-to-weight ratios.[98] The standard equipment on most modern combat aircraft produced today includes many of the capabilities noted above. The ability of nations to upgrade their air force's capabilities compound not only the challenges faced in collecting intelligence, but also the training of USAF combat aircrews on the capabilities and tactics of an increasingly varied array of possible air threats.

With the growth of arms sales in the post-Cold War world, many countries operate aircraft from both the former Soviet bloc and the West, complicating combat identification by flying aircraft such as the F-5 *and* MiG-21. Prospective NATO nations, such as Poland, Hungary, and Czech, still operate Soviet military hardware, including late model Soviet combat aircraft. Future conflicts involving these nations' forces could raise the age-old military problem of combat identification to a nightmarish level. Training USAF combat aircrews on all the possible combinations of aircraft and tactics presents a significant challenge.

[98] Ibid., 7-12.

Air Expeditionary Force (AEF)

To this point, this study has shown how the threat today to U.S. airpower and interests around the globe remains substantial. In addition, U.S. Air Force doctrine has shifted from the Cold War stance of forward-basing assets against substantial adversary capabilities (Central Europe), toward a U.S.-based airpower projection capability based on global speed and flexibility. This doctrinal shift manifests itself in the form of the Air Expeditionary Force (AEF). This shift also has more impact upon the role of adversary *training* than the mere inventorying of global airpower threats. The varied array of air threats that could be mustered against an AEF with global responsibilities requires an organization dedicated to training against all possible adversaries.

Brigadier General William R. Looney III, commander of AEF II that deployed to Jordan in support of Operation SOUTHERN WATCH in 1995, describes the essence of the AEF as follows:

As the Air Force enters the twenty-first century, it must prepare itself to furnish devastating combat airpower at a moment's notice anywhere in the world. This force must be able to mobilize and deploy rapidly; upon arrival, it must be able to respond to the CINC's wartime air tasking; and finally, it must be able to furnish reliable and sustained airpower.[99]

A typical AEF package, deployed from either a single base or composed of assets from several bases, mobilizes its aircraft, support structure, and personnel, and with either theater or strategic airlift, deploys to a forward location. The package will likely

[99] Brigadier General William R. Looney III, USAF, "The Air Expeditionary Force: Taking the Air Force into the Twenty-first Century," *Airpower Journal* 10, no. 4 (Winter 1996), 4.

comprise twelve air superiority, twelve ground attack, and six suppression of enemy air defense (SEAD) fighters, as well as four air refueling tankers.[100]

The main factor limiting this concept of operations is access to airfield and support facilities in an area of operations. However, given today's vastly reduced U.S. military force structure stretched thin across the globe, an AEF may be a theater CINC's only option in a time-critical situation. In light of recent refusals by some countries to allow access in crisis situations, Air Force leadership realizes that an AEF may have to breach an airfield, secure it, then defend it while conducting air operations.[101] Once in place and operating, the potential air threat environment could be challenging for a small, albeit capable, force such as an AEF.

AEF components would require qualitative equipment and training advantages to stave off a numerically superior enemy air attack. Because of the AEF's limited size, a potential adversary would not require an extremely large force to saturate an AEF's defensive capability. A hostile force of a dozen SU-27s, escorting another dozen SU-24 ground attack aircraft determined to attack an AEF operating base is not out of the realm of possibilities. Even if the AEF's air superiority fighters were airborne to meet such an attack, they would engage a capable force outnumbered, not unlike engagements expected to occur during a Soviet attack in Central Europe a decade ago. To insure success in such a scenario, AEF fighter aircrews would require knowledge of the capabilities of the enemy aircraft, known upgrades performed on them, weapons they carry, observed tactics, likely tactics given the situation, command and control systems, known and potential weaknesses, and experience and capabilities of the enemy pilots.

[100] Ibid., 5.
[101] Esmond.

Certainly before deploying, AEF personnel would receive intelligence situation briefings covering these topics. However, how much more effective would they be tactically if AEF aircrews had already flown practice engagements, covering a multitude of possible tactical scenarios, against an adversary training force replicating the enemy's aircraft and tactics capability with extremely high fidelity? The answer may be difficult to quantify objectively, but clues certainly lie in the lessons of history that are in plain view from Southeast Asia and Operation DESERT STORM. The next chapter will synthesize these lessons, along with the evolved requirement for dedicated adversary air training and the anticipated operational environment of the future, into proposed alternatives for this capability in the USAF.

Chapter 5

Adversary Training Alternatives

> *A robust adversary training capability is an investment against a declining experience level in our operational force. The CAF are a well-trained force. However, there is not as much opportunity to train to the same experience level we had before the Gulf War because of the large number of commitments we participate in around the world.*

Major General Marvin Esmond

Commander, USAF Air Warfare Center

Although small in size, the empirical data drawn from the Air Force's performance in air combat during the Gulf War points to the conclusion that the training conducted by the former Aggressor program helped raise the proficiency level of USAF aircrews for air combat. However, other changes occurred during the period between the end of U.S. involvement in Vietnam and the start of the Gulf War that must be considered relative to aircrew proficiency. The introduction of the F-15 with its single role air-to-air mission, the upgrade of air-to-air missile technology, and the advent of Airborne Warning and Control System (AWACS) aircraft with far greater capability than those used during Vietnam were all giant leaps forward in technology that dramatically raised the effectiveness of USAF aircrews in air-to-air combat.

Conversely, anecdotal information since the Gulf War begins to reveal a disturbing trend of lowered air combat proficiency when considering the dramatic reduction of

dedicated adversary air training, the loss of training opportunities due to contingency deployments, and the drawdown that caused the loss of DACT training opportunities. For example, it is becoming more common for an F-15C pilot not to achieve a simulated air-to-air kill in a RED FLAG exercise until well into the second week of training.[102] In addition, prospective students arrive at the Weapons School to attend that demanding course with atrophied Basic Fighter Maneuvering (BFM) skills because of the dearth of training opportunities while deployed.[103]

Other intangible benefits were lost with the reduction of dedicated adversary training. The existence of a dedicated adversary force instills the "spirit of attack" into the combat aircrews they train. The ability to practice against a professional sparring partner is crucial to the honing of air combat skills. Maintaining such a training capability also displays the Air Force's commitment to readiness.[104] A robust adversary training capability may also provide a deterrent effect on potential adversaries around the world. If an opponent in an air war knows that his foe possesses his equipment, the knowledge of his employment doctrine and tactics, and has practiced against them, such knowledge may influence his strategic calculations. Colonel Charles "Westy" Westenhoff, director of the Commander's Action Group at the USAF Air Warfare Center, notes "[the enemy] will think twice about engaging you. If, when there are USAF air superiority fighters in the air, the enemy is convinced he is going to die, this will have an effect on enemy leadership, and most certainly on the enemy air force."[105]

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[102] Burton.
[103] Lay.
[104] Cazessus.
[105] Westenhoff.

Characteristics of Adversary Training Capability

The examination of adversary training in the USAF highlights requisite characteristics for an effectual adversary training capability. The efficacy of dedicated adversary air training programs can be determined by considering the following elements: threat replication, breadth of coverage, and affordability. These criteria are used to draw a comparison of previous adversary training with today's capability, then project the results into a desired future capability.

Threat Replication

The ability of an adversary training program to replicate accurately the capabilities of potential enemy aircraft is crucial when training for a specific threat. Ideally, the most accurate representation of threat capabilities is made with the use of the actual aircraft. The availability and cost of such weapons systems generally prohibit this option, leaving the substitution of a suitable friendly aircraft possessing the same general characteristics as the next best option.

Past experience with dedicated dissimilar adversary training shows that it provides two advantages. The first is the general benefit of training against a dissimilar aircraft. This enables a pilot to maximize the advantages and minimize the disadvantages of his aircraft. It also helps to avoid the "mirror-imaging" of expected enemy responses. The second advantage is the particular benefit of high fidelity threat replication. In the current threat environment, where a wide-range of threat aircraft and capabilities exist, exactly replicating each would become prohibitively expensive. However, the ability to focus on a most likely threat as situations present themselves becomes of paramount importance, e.g., the replication of Iraqi Mirage F-1s before DESERT STORM.

Breadth of Coverage

Breadth of coverage for dedicated adversary training is further defined as the size of the adversary force with respect to its sortie generation capacity, and thus the ability it has to provide maximum exposure to USAF combat aircrews. This coverage capability should correspond to the best return on the training investment, i.e., for basic dissimilar air combat training or graduate-level large force exercises. The breadth of coverage criterion has the greatest weight assigned of the three elements.

The size of the organization must be sufficient to generate enough annual sorties to 1) meet the RED FLAG adversary sortie requirement without adversary unit augmentation (2,280 sorties), 2) help defray the 2,674 deficit Red Air sorties needed to comply with F-15C RAP sortie maximums (nine hundred adversary sorties against F-15Cs and 2,250 Weapons School support sorties for a total of 3,150), and 3) meet internal upgrade and unscheduled requirements (four hundred sorties).[106] This annual sortie total of 5,830 would deliver a minimum of graduate-level adversary support to the CAF, with more in-depth (including basic) DACT for F-15C pilots, who continue to fly the single-role air superiority mission. In addition, the increased adversary support to the Weapons School will relieve F-15C units from providing those Red Air sorties, effectively returning Blue Air sorties to Combat Mission Ready (CMR) F-15C pilots.

Affordability

This criterion, while addressing the fiscal affordability of an adversary air training capability in general terms, must also account for more than the monetary cost of such a

[106] Headquarters Air Combat Command (HQ ACC/DOTO/XPPP), *Aggressor Requirements and Plus-Up Options*, briefing charts, Langley AFB, VA, 16 March 1998,

capability, for example, the zero-sum game involved in today's constrained budget environment. In this environment, force structure must necessarily be drawn down to provide increases in other areas. It also addresses, in relative terms, the costs of *not* employing such a training capability with respect to the risk of failure to gain and maintain air superiority and the subsequent increased friendly casualties due to deteriorated air combat proficiency.

Overall Efficacy

Using the above criteria, the overall efficacy of an adversary training program can be assessed as high, medium, or low with respect to the program's ability to increase the proficiency and effectiveness of USAF air combat capability. This system provides only relative assessments, as the true efficacy will only manifest itself in kill ratios and air combat performance in the next conflict.

Criteria Applied to Previous Capability

It is helpful to test the aforementioned criteria by applying them to previous capabilities. As discussed in the previous chapters, there were three distinct phases of adversary training in the USAF since the inception of the Aggressor program. The first was the use of the Aggressors in a building block approach to DACT, while simultaneously replicating the threat with the T-38/F-5E flying as a surrogate MiG-21. The second phase was the use of the Aggressors as graduate-level training with lower fidelity of threat replication, with the F-5E replicating newer Soviet aircraft such as the MiG-23 and MiG-29. The third and current phase includes a higher fidelity of threat

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replication (with the F-16 replicating the latest Soviet aircraft), but with significantly reduced DACT for a majority of the CAF, and less breadth of coverage for training the population of USAF combat aircrews.

Phase I (Program Inception to Early 1980s)

The threat replication fidelity of the MiG-21 by the early Aggressors was at first low with the T-38, then quickly became high with the introduction of the F-5E. Regardless of the aircraft employed, the benefits of merely training against a dissimilar adversary became apparent through anecdotal information. The Air Force instituted the program too late to make a difference in empirical data from the Vietnam War. However, as noted in Chapter Two, increased kill ratios for Navy aircrews after the establishment of a Navy adversary training program supports the conclusion that DACT is beneficial to air combat proficiency.

The breadth of coverage of the Aggressor program in Phase I was low because of the limited size the program, but quickly increased as the Air Force expanded the Aggressors at Nellis and added more adversary squadrons in the European and Pacific theaters. On a limited basis, the program was highly effective for the specially selected aircrews that received the F-4E Top Off program and the Aerial Attack portions of the Fighter Weapons School syllabus during the latter portion of the Vietnam War. The breadth of coverage of the Aggressor program dropped off during the early 1980s because of the rapidly expanding size of the fighter force and the subsequent demand for Aggressor training.

The affordability was favorable initially because of the low cost of using Air Training Command aircraft, followed by the windfall of F-5Es intended for South

Vietnam. The costs in terms of *not* establishing an Aggressor capability were initially unacceptably high due to the probable high rate of loss of U.S. aircraft and crews against the NVAF, and later against the Soviet Air Force in any possible conflict with the USSR.

The overall efficacy of the adversary training capability for Phase I is high.

Phase II (Early 1980s to End of F-5E Era)

The accuracy of the threat replication of the Aggressor program steadily decreased during the 1980s as the Soviet Union began introducing fourth-generation aircraft into its inventory. While tactics replication accuracy remained high, aircraft replication fidelity dropped, finishing out the last of the F-5E adversary capability in the late 1980s as low. Conversely, the rapidly expanding fighter force did provide the added benefit of increased DACT. The many fighter wings throughout the Air Force as well as the Navy and Marine Corps provided ample opportunity for training among different weapons systems.

The effectiveness of the Aggressor program during this phase with respect to breadth of coverage is assessed as medium. While not able to provide extensive basic DACT, the size of the adversary training force leveled out at a 36:1 operational to adversary aircraft ratio, providing a breadth of coverage at the graduate, or large-force tactics training level.

Affordability remained favorable during Phase II because of the relative low-cost of operating the F-5E, but sank to low as it became apparent that the F-5E was reaching the end of its serviceable life. The cost of *not* maintaining an adversary training capability was high, as the extraordinary air combat successes in the Gulf War probably could not have been attained in the absence of an adversary training capability.

The overall efficacy of the adversary training capability for Phase II is assessed as medium.

Phase III (Introduction of F-16 Adversaries to Present)

When TAC chose the F-16 as the adversary air training replacement aircraft, the aircraft replication accuracy again rose to high with respect to replication of turn performance, fire control systems, and weapons capability of newer Soviet technology aircraft. However, these advantages are severely degraded by the F-16's similarity with over 50% of the present inventory of fighter aircraft in the CAF [107], mitigating the advantages of DACT discussed in Chapter Two. Because of this drawback, threat replication in Phase III is medium.

The breadth of coverage at the outset of this phase was medium, as the F-16s of the transformed adversary training force had a limited capability to visit operational units and still provide training for RED FLAG and other large-force exercises. However, this breadth of coverage sank quickly to low when all the Aggressor squadrons were closed and the number of dedicated adversary aircraft reduced to six. At this point, the amount of adversary training for Air Force aircrews shrank to a small fraction of the original Aggressor program.

The affordability of adversary training in Phase III is favorable due to the small inventory of pilots and aircraft required to maintain the limited F-16 adversary capability. However, the cost of *not* maintaining robust adversary training is also assessed as high because of factors such as reduced DACT opportunities, the development of poor habit

[107] Ibid., 9.

patterns when flying against similar aircraft, and the lack of specific training on potential threat aircraft and tactics.

The overall efficacy of the Phase III adversary capability is low.

Reversing the Downward Trend

When using the above criteria to assess the efficacy of dedicated adversary air training, a steady decline in capability emerges from the peak of the program in the mid-1980s to the present. The USAF must bolster its dedicated adversary air training to prevent a "full circle" return to the underdeveloped air combat skills present in the Air Force of the 1960s. The abundance of DACT opportunities in the late 1980s, coupled with the disappearing Cold War threat, led Air Force leadership to discontinue an essential function in the Aggressors, chalking up the savings as part of the so-called "peace dividend." Today's demanding environment of high tempo operations and limited air combat training opportunities clearly demonstrates the need for a robust dedicated adversary air training capability in the USAF.

Alternatives

The above discussion assesses the current adversary air training capability as being insufficient to meet the requirements of air combat proficiency in the USAF. Therefore, three alternatives are examined to increase the Air Force dedicated adversary training program to a level capable of providing the required DACT and threat training to sustain air combat proficiency in the CAF. These are the use of actual threat aircraft, a mixed training force of F-15 and F-16 aircraft, and a combination of the first two alternatives using both U.S. and Russian aircraft.

Actual Threat Aircraft (MiG-29)

With the recent U.S. purchase of twenty-one Moldovan MiG-29s under the Cooperative Threat Reduction (CTR) program, an increase in adversary training opportunities presents itself. The CTR program was legislated by Congress to assist the republics of the former Soviet Union in dismantling their nuclear and other weapons of mass destruction.[108] Because the variant of the MiG-29 purchased from Moldova was capable of carrying nuclear weapons, the U.S. Department of Defense used CTR funds to purchase these aircraft. Exported in large numbers from the former Soviet Union and (since 1991) Russia, the MiG-29 represents a significant portion of the high-technology threat aircraft in the world today. The threat replication fidelity would clearly not be an issue, and is assessed as high for the SU-27 as well, because of similarity between the two in terms of fire control systems, weapons capability and employment, and physical appearance.

Several factors affect the breadth of coverage of the MiG-29 option. The MiG-29 has significantly less endurance than the F-15 or F-16, reducing the total number of air combat engagements available during a training sortie. Out of the twenty-one MiG-29s, it is realistic to designate twelve as primary mission aircraft inventory (PMAI). The remaining nine must be allocated to maintenance trainer aircraft, test and evaluation functions, backup aircraft inventory (BAI), and attrition reserve (AR). The twelve PMAI would enable an annual sortie capability of approximately three thousand, based on an

[108] Department of Defense On-Site Inspection Agency, *The Cooperative Threat Reduction Program*, fact sheet, May 1996, on-line, Internet, 19 May 1998, available from http://www.osia.mil/pub_afrs/ctr.html.

equivalent F-16 sortie generation rate. This number still falls short of filling the annual adversary sortie requirements identified in Chapter Three.

Simply possessing MiG-29s would not translate into a training bonanza. Since inheriting MiG-29s from the former East Germany after German reunification, *Luftwaffe* commanders, even when possessing the technical expertise and logistical support, have barely managed to maintain a 40% full mission capable rate.[109] The Soviet system of maintenance was much different from that of the USAF. The Soviets did not maintain significant local repair capabilities. Their system consisted of flying sorties on an aircraft until it became "hard-broke," then the aircraft factory sent a new or repaired aircraft to replace the unserviceable one. There was no intermediate or depot level for repair, as all maintenance expertise was located at the factory. These factors, coupled with the small numbers of MiG-29s available for use, would serve to limit the breadth of coverage for adversary training. Thus, the MiG-29 breadth of coverage is assessed as medium-to-low.

Finally, the affordability of the MiG-29 option is unfavorable. The estimated cost per flying hour of a MiG-29 is nearly $20,000, as compared to $2500 for an F-16 and $4500 for an F-15.[110] In addition, this option would require start-up costs estimated at over $100 million for rehabilitation of the MiG-29 engines, maintenance personnel training, aircraft spare parts, and support equipment.[111] Conversely, the cost of *not* maintaining the MiG-29 adversary option is medium with respect to the risk of not training aircrews against the actual threat aircraft. Training against the actual threat

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[109] Major Fred Clifton, USAF, USAF exchange pilot with the German Air Force MiG-29 squadron, First Fighter Squadron, Fighter Wing 73 "Steinhoff", Laage Air Base, Germany, interviewed by author, 25 January 1998.
[110] Imonti.
[111] Ibid., proprietary contractor information provided to Major Imonti.

aircraft is always the preferred method, however, the low affordability would severely limit the numbers of aircraft available for use in training.

The overall efficacy of the MiG-29 option is low. Even at U.S. sortie generation levels, this option provides less than one-third of the annual required adversary sorties. Prohibitively high start-up and operating costs, coupled with low reliability and short endurance preclude the actual threat aircraft option from serious consideration in a widespread adversary program.

F-15/F-16

This is not the first study that examines an adversary capability that consists of a mixed F-15/F-16 Aggressor option.[112] The reason that this is an attractive option is twofold. First, the F-15 is able to replicate the SU-27 with high fidelity. It is comparable in fire control systems, weapons capability, turn performance and physical size. It also closely resembles the SU-27 in appearance. The F-16, as already noted, is capable of closely replicating the MiG-29. As SU-27s and MiG-29s (or variations of each model) represent both the typical and worst-case high-technology threat, the F-15/F-16 combination is a good match. Second, this combination returns to adversary training a true dissimilar capability. As more than 50% of the CAF consists of various models of the F-16, the F-15 adversary aircraft can be scheduled exclusively against them for DACT. Composite force packages of both threat types can be flown together as training and exercise scenarios dictate. The threat replication of the F-15/F-16 option is assessed as high.

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[112] For an in-depth discussion of this option see Mark M. Rumohr and Gary C. West, *F-15/F-16 Mixed Aggressor Force for the Future*, (student paper presented to Air

The ideal number of aircraft in this option for breadth of coverage is fifteen F-15Cs and twelve F-16Cs. The larger number of F-15Cs would generate a higher sortie rate to meet the dissimilar sorties required by the F-16 Division of the Weapons School, thus alleviating more of the Red Air sortie requirements levied on the Combat Mission Ready (CMR) F-15C community. The resulting 2,950 F-15C annual sorties[113] and 2,970 F-16C sorties, for a total of 5,920 annual adversary sorties, meets the 5,830 ACC Aggressor sortie requirement goal specified in Chapter Three. The F-15/F-16 option's breadth of coverage is assessed as high.

The affordability of the mixed F-15/F-16 option is medium. The F-16s are already available at Nellis; the currently funded six, combined with the three BAI and four AI aircraft, provide the required number of aircraft. Therefore, the program only needs funding for flying hours and maintenance support to bring the PMAI to 12 F-16Cs. The Adversary Tactics Division estimates the bill for additional manpower for the total package of F-15s/F-16s to be $4.0 million annually. This figure is offset by an amount equal to the cost savings derived by decreased TDY costs for units deploying to Nellis for Weapons School and RED FLAG adversary support, a figure of $1.2 million annually.[114] There would also be initial costs of approximately $2.0 million for ground support equipment. The significant limiting factor to this option, however, is the availability of F-15C aircraft, as attrition reserves within the CAF fleet are minimal.[115] As realignment of the aircraft force structure is beyond the scope of this study, it should suffice to say

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Command and Staff College), Maxwell AFB, AL, 1988.

[113] Each F-15C can not fly as many times per month as an F-16C due to increased age of the F-15C fleet and slightly more complex maintenance requirements, hence the lower annual sorties for the F-15C.

[114] Burton.

[115] HQ ACC/DOTO/XPPP, 21.

that as units close in the near future, F-15Cs could be diverted to Nellis to fill this role. Likewise, closing an active or reserve unit may provide some of the necessary aircraft. Colonel Ricardo Cazessus, vice commander of the 57th Wing, notes that, "we will always find the money and resources to do the right thing."[116] The risk of *not* doing "the right thing" lies in the return to poor air combat performance in a future conflict, especially against a numerically superior foe equipped with high-technology aircraft.

The efficacy of the F-15/F-16 option is assessed as medium. While this option provides excellent threat emulation and true DACT capability for the CAF, limitations on available airframes require a commitment from the Air Force leadership to make difficult choices on drawing resources from the active or reserve forces, possibly causing a short term increase in the operations tempo for some units. However, relieving units from the necessity of deploying to Nellis for Weapons School or RED FLAG adversary support should ease the operations tempo burdens in the end.

Combined F-15/F-16 and Limited MiG-29

This option combines the first two alternatives but reduces the number of MiG-29s to a level sufficient to launch four sorties per flying period at Nellis, probably six aircraft. Threat replication capabilities of these aircraft have already been discussed; the value of adding actual threat aircraft into RED FLAG or other large force exercises at Nellis is emphasized by Major General Esmond, commander of the Air Warfare Center at Nellis, "When young pilots see the real thing for the first time [at RED FLAG], it will make the hair stand up on the back of their necks. Yet, when they see the real thing again in a

[116] Cazessus.

combat situation, they can say 'I've seen it, I've fought it, I've beat it.'"[117] Introducing these aircraft into an exercise environment adds an element of the unknown, increasing the realism to a higher level.

Adding the MiG-29s to RED FLAG would release 1,920 sorties per year from the F-15/F-16 adversaries, allowing them to contribute more sorties either to Weapons School support or to operational squadrons. As a result, the breadth of coverage is assessed as high, as the effect would be to expose CAF aircrews to actual threat aircraft at a familiarization level, and free enough adversary sorties to allow basic DACT for CAF aircrews other than those flying F-15Cs.

Affordability is assessed as medium as the above numbers apply from the F-15/F-16 option, as well as a substantial cost to operate the MiG-29s, on the order of $22.9 million for engine rehabilitation for the six MiG-29s. However, using the remaining MiGs for spare parts and maintenance training would reduce the costs for those items to approximately $10 million, bringing the initial costs to $32.9 million for the MiG-29s.[118] The cost of *not* providing this capability encompasses the same risk as with the actual threat aircraft option, lowering the threat familiarization training for CAF aircrews, and disallows the use of F-15/F-16 adversary sorties to provide basic DACT to CAF aircrews other than F-15C pilots.

Recommended Option

The combined F-15/F-16/MiG-29 option is recommended as the most effective dedicated adversary air training structure within current budgetary constraints. Although

[117] Esmond.
[118] Imonti, proprietary contractor information provided to Major Imonti.

not the least expensive in dollars, this alternative provides a robust adversary capability, most importantly through a true DACT capability for the CAF and threat familiarization training with actual threat aircraft. The Air Force has learned its lesson once, in the skies over Southeast Asia, on the dangers of atrophied air combat skills combined with poor habit patterns from flying against similar adversaries. It is within the Air Force's ability to keep that history from repeating itself.

Though not part of dollar cost figures, aside from manpower slots, it is important to describe the role of the adversary pilot. What the Air Force attempts to achieve with its adversary training program is "a recognized and established, professional group of experts. With a strong adversary capability, we can export our capital experience pool as a cadre of credible instructor pilots to an operations group commander, who can use it to tailor his training requirements to maintain the air combat proficiency he needs to meet his readiness commitments."[119]

The Air Force should thoroughly explore innovative funding methods for an increased adversary training capability, as growing congressional interest in military readiness may provide unique funding opportunities. An example was the willingness to fund the purchase of the Moldovan MiG-29s through the Cooperative Threat Reduction Program. A robust adversary training capability is easily justified as a necessary component of military readiness.

Eye to the Future

The Air Force must tailor its adversary air training program with future requirements in mind. Some assumptions can be made about future operating environments:

1. According to Lieutenant General Hughes, director of the Defense Intelligence Agency, the U.S. will not have a peer competitor for the next one to two decades.[120] The USAF has an opportunity to leap farther ahead during this "strategic pause" by both taking advantage of the opportunity to restructure forces more efficiently and develop far-reaching technologies to widen the gap over potential adversaries. Ensuring that an adversary training force is well-equipped and "right-sized" will help maintain that gap.
2. The U.S. will continue to remain engaged in worldwide operations involving low intensity conflict or MOOTW. The U.S. will find it increasingly difficult to form coalitions and obtain host-nation support for military action. The capability to breach airfields to conduct air expeditionary force operations may be required in the future. An adversary training program tailored to the specific threat in a projected area of operations is essential to the success of USAF aircrews in air combat.
3. The U.S. will continue development and fielding of the F-22 and Joint Strike Fighter (JSF) aircraft for F-15 and F-16 replacement. With no peer competitor on the horizon, F-15/F-16/MiG-29 adversary aircraft can continue to provide high fidelity adversary replication throughout the fielding period of the JSF. With the leap in technology the F-22 and JSF represent, "[their] integrated avionics and weapons systems will provide even more rationale for dedicated Red Air assets."[121]
4.
5. In the race to preclude a return to the "hollow force" of the post-Vietnam drawdown period, the Air Force may have become overly concerned with maintaining combat force structure at the expense of necessary training assets. The essence of both the Bottom-Up Review (BUR) and the Quadrennial Defense Review (QDR) was posturing to win wars not through overwhelming quantity of forces, but with concentrated quality through a focus on training. A robust adversary air training capability provides the method for achieving that concentrated quality in the air-to-air combat environment of any future air war.
6. The final chapter proposes a transition path to the recommended adversary air training alternative in terms of aircraft procurement, funding, and implementation timelines.

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[119] Esmond.
[120] Hughes.
[121] Wolters.

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